# HORTICULTURAL ABSTRACTS

Vol. XXIV December, 1954 No. 4

Initialled abstracts and reviews not by Bureau staff are by G. H. Freeman, R. J. Garner, G. M. Jolly, M. M. Macneill, S. C. Pearce and H. C. Ruck of the East Malling Research Station, G. St.C. Feilden and C. Savage.

## INDEX OF CONTENTS.

*Nos.*
MISCELLANEOUS Abstr. 119. Noted 40 .. 3324-3444n
General .. .. .. .. 3324-3338
Experimental design .. .. .. 3339-3346
Botany .. .. .. .. 3347-3359
Physiology .. .. .. .. 3360-3374
Growth substances .. .. .. 3375-3387
Biochemistry .. .. .. .. 3388-3397
Radioactive isotopes .. .. .. 3398-3399
Nutrition .. .. .. .. 3400-3414
Soil management and irrigation .. 3415-3422
Climate and weather .. .. 3423-3424
Glasshouses .. .. .. .. 3425-3432
Sundry appliances and materials .. 3433-3442
Noted .. .. .. .. .. 3443a-3444n

TREE FRUITS, DECIDUOUS
Abstr. 94. Noted 24 3445-3539x
General .. .. .. .. 3445-3450
Breeding and varieties .. .. 3451-3458
Propagation and rootstocks .. 3459-3484
Growth phenomena .. .. .. 3485-3489
Pollination .. .. .. .. 3490-3494
Spraying for cultural purposes .. 3495-3502
Pruning and training .. .. 3503-3505
Manuring, soil management and irrigation .. .. .. .. 3506-3513
Composition .. .. .. .. 3514-3516
Storage .. .. .. .. 3517-3531
Grading and marketing .. .. 3532-3534
Processing .. .. .. .. 3535-3538
Noted .. .. .. .. .. 3539a-3539x

SMALL FRUITS, VINES AND NUTS
Abstr. 32. Noted 19 3540-3572s
Small fruits .. .. .. .. 3540-3555
Vines .. .. .. .. .. 3556-3569
Nuts .. .. .. .. .. 3570-3571
Noted .. .. .. .. .. 3572a-3572s

PLANT PROTECTION OF DECIDUOUS FRUITS
Abstr. 116. Noted 51 3573-3690y
General .. .. .. .. 3573-3576
Disturbances of nutrition or of unknown origin .. .. .. 3577-3585
Climatic factors .. .. .. 3586-3588
Viruses .. .. .. .. .. 3589-3601
Bacteria .. .. .. .. 3602-3603
Fungi .. .. .. .. .. 3604-3625
Mites .. .. .. .. .. 3626-3630
Insects .. .. .. .. .. 3631-3661
Other pests .. .. .. .. 3662-3663
Antibiotics and entomophagous organisms .. .. .. .. 3664-3667
Fungicides and insecticides .. 3668-3678
Spray deposits and residues .. 3679-3685
Apparatus .. .. .. .. 3686-3688
Noted .. .. .. .. .. 3689a-3690y

WEEDS AND WEED CONTROL
Abstr. 68. Noted 16 3691-3759p
General .. .. .. .. 3691-3697
Herbicides .. .. .. .. 3698-3716
Particular weeds .. .. .. 3717-3728
Control of aquatic weeds .. .. 3729
Control of woody plants .. .. 3730-3738
Weed control in fruit crops .. .. 3739-3740
Weed control in tropical crops .. 3741-3751
Weed control in vegetables .. 3752-3758
Noted .. .. .. .. .. 3759a-3759p

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE Abstr. 195. Noted 42 3760-3956p
General .. .. .. .. 3760-3788
Artichoke, globe .. .. .. 3789-3791
Asparagus .. .. .. .. 3792-3797
Brassicas .. .. .. .. 3798-3819
Celery .. .. .. .. .. 3820-3824
Cucurbits .. .. .. .. 3825-3840
Legumes .. .. .. .. 3841-3871
Mushrooms .. .. .. .. 3872-3875
Onions and related crops .. .. 3876-3885
Root crops .. .. .. .. 3886-3901
Salad crops .. .. .. .. 3902-3905
Spinach .. .. .. .. 3906-3907
Tomatoes, eggplants and capsicums 3908-3954
Noted .. .. .. .. .. 3955a-3956p

TOBACCO Abstr. 46. Noted 5 3957-4003e
General .. .. .. .. 3957-3961
Breeding and varieties .. .. 3962-3968
Cultural practices .. .. .. 3969-3971
Nutrition and irrigation .. .. 3972-3979
Diseases .. .. .. .. 3980-3990
Pests .. .. .. .. .. 3991-3996
Composition and curing .. .. 3997-4002
Noted .. .. .. .. .. 4003a-4003e

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS Abstr. 64. Noted 26 4004-4068z
Culinary and spice plants .. .. 4004-4005
Drug plants .. .. .. .. 4006-4014
Essential oils .. .. .. .. 4015-4026
Fibres .. .. .. .. .. 4027-4038
Hops .. .. .. .. .. 4039-4048
Insecticidal plants .. .. .. 4049-4053
Rubber plants .. .. .. .. 4054-4057
Seed oils .. .. .. .. 4058-4064
Tannin plants .. .. .. .. 4065
Sundry plants .. .. .. .. 4066-4067
Noted .. .. .. .. .. 4068a-4068z

| | Nos. |
|---|---|
| FLORICULTURE Abstr. 95. Noted 39 | 4069-4163m |
| General | 4069-4077 |
| Annual and herbaceous plants | 4078-4098 |
| Bulbs, tubers, etc. | 4099-4119 |
| Lawns | 4120-4124 |
| Orchids | 4125-4127 |
| Succulents | 4128-4131 |
| Roses | 4132-4136 |
| Other trees and shrubs | 4137-4161 |
| Noted | 4162a-4163m |
| SUB-TROPICAL FRUIT AND PLANTATION CROPS Abstr. 100. Noted 32 | 4164-4265f |
| Avocadoes | 4164-4178 |
| Carobs | 4179-4180 |
| Citrus—general | 4181-4182 |
| Citrus—varieties, rootstocks and propagation | 4183-4189 |
| Citrus—cultivation and irrigation | 4190-4191 |
| Citrus—tree composition and nutrition | 4192-4204 |
| Citrus—growth phenomena, fruit set and fruit drop | 4205-4212 |
| Citrus—fruit composition | 4213-4216 |
| Citrus—frost effects | 4217-4218 |
| Citrus—diseases and pests | 4219-4241 |
| Citrus—packing, storage and by-products | 4242-4249 |
| Dates | 4250 |
| Litchis | 4251-4252 |
| Macadamias | 4253-4254 |
| Olives | 4255-4262 |
| Passion fruit | 4263 |
| Noted | 4264a-4265f |
| TROPICAL FRUIT AND PLANTATION CROPS Abstr. 180. Noted 52 | 4266-4447z |
| General | 4266-4276 |
| Bananas | 4277-4284 |
| Cacao | 4285-4308 |
| Cinchona | 4309-4310 |
| Cloves | 4311 |
| Coconuts | 4312-4321 |
| Coffee | 4322-4345 |
| Guavas | 4346-4347 |
| Mangoes | 4348-4349 |
| Oil palms | 4350-4352 |
| Papaws | 4353-4354 |
| Pineapples | 4355-4356 |
| Rubber trees | 4357-4361 |
| Sugar cane | 4362-4426 |
| Tea | 4427-4439 |
| Sundry crops | 4440-4445 |
| Noted | 4446a-4447z |
| NOTES ON BOOKS AND REPORTS Abstr. 46. Noted 13 | 4448-4494m |
| Books | 4448-4460 |
| Annuals and reports | 4461-4491 |
| New and revived periodicals | 4492-4493 |
| Noted | 4494a-4494m |

Total abstracts 1,155. Noted 359.

N.B.—Numbers sub-divided alphabetically refer to items noted but not abstracted.

# EDITORIAL NOTES

## SUGGESTIONS FOR THE IMPROVEMENT OF THE JOURNAL

Had all our readers responded to our appeal for suggestions we should have been gratified but overwhelmed. In the event we are extremely grateful to those who did respond and we feel that under other circumstances, east of the Oder for instance, they might have been fervently acclaimed as "Heroes of *Horticultural Abstracts*".

This laudatory title, if one considers it, would have much to commend it. For, in our opinion, anyone who reads *Horticultural Abstracts* at all except from a stern sense of duty must be a hero, and he who not only reads the abstracts but also the preamble and furthermore responds to appeals in that preamble is not merely a hero but a very useful person with opinions well worth considering. Let us then consider them.

**Review articles would be welcomed.**

A plea for the inclusion of review articles on particular phases of the work covered in the abstracts, as is the practice in some other C.A.B. journals, comes from three readers, all Official Correspondents, all only mildly in favour of Salient Items.

Personally, although we believe in the desirability of review articles, we do not believe that an "abstract" journal is the right place for them. We suggest, moreover, that Salient Items does in effect, in tabloid form, afford a survey, or at least the means of surveying, different aspects of work covered by the abstracts.

Further, we already provide such surveys elsewhere, for many horticulturists write to us for references and information on particular problems. Our replies vary from a list of references, unadorned or annotated, to an amply documented appraisal of the position, in other words a survey or review article. These are not included in *Horticultural Abstracts* because the journal is already large and costly enough. That is an important point, especially in view of the ever-increasing flow of horticulturally important literature with which we have to cope. The problem of selecting and editing has, moreover, to be considered against the background of such comment as: "Do not prune your abstracts more.

Matters which you may consider unimportant may easily be of great importance to us here". If, over and above essential abstracts we also included review articles, bulk, cost of printing and inevitably price would rise and economic availability to the man only interested in a small portion of each number inevitably fall.

One thing more. Originally replies to enquiries were known and available only to individuals. For many years now we have sent to our Official Correspondents and a slowly increasing number of other persons, a so-called Quarterly Letter in which we have noted the availability of such information and have thereby ensured wider distribution.

In 1955 we propose in the March number of *Horticultural Abstracts* to list some of the more important items of information thus compiled in 1954 and to send copies of the information to those interested enough to apply for them, so long as copies are available. According to the response we shall decide whether to adopt this as a yearly practice.

**More frequent publication is desirable.**

We are surprised and somewhat relieved that only one of our readers raised the point. Can we perhaps assume from this lack of comment that the present quarterly frequency, which encourages the collection in one place of a fair number of items on any one subject, is preferred to more frequent publication and dispersal of information?

**More space should be given to articles in inaccessible journals.**

This is our aim. It is not, however, always very obvious in the result, because we also have to weigh the merits of any such article against the retiring nature of the journal. We would remind our readers that we can generally "put them in touch" with the original article. This reminder may serve partially to answer the criticism of one correspondent, not unnaturally hipped on following up a Salient Item reference to find, not an abstract, but merely a reference.

**Quicker indexing is desirable.**

We bestow immense trouble on indexing and experience leads us to believe that while we can produce a satisfactory yearly index the production of an index at the same time as the abstracts would be excellent window dressing rather than satisfactory to either our readers or ourselves.

One correspondent was unaware that we issue subject indexes at all. Another, on the other hand, writes, "At the end of the year the full index is gratefully received and that and the four parts of the volume only then begin their fully active life".

We infinitely regret that the care which we have this year bestowed on improving the index has resulted in the very late issue of the index to Vol. 23, which, indeed, you will have only recently received when Vol. 24, No. 4 comes to hand. We believe readers will benefit from that care. In future years indexes are likely to be very much more timely. That for Vol. 24 will go to the printers this year.

One writer suggests that we should issue the same sort of index of contents as appears in each number of the *Review of Applied Entomology*, another that we should follow the example of the *Review of Applied Mycology* and give each time a short alphabetical subject index. The objection to following *R.A.E.* practice is that 10 pages or more in each number of *H.A.* would have to be devoted to such an index. As regards the *R.A.M.* subject index, does not the List of Contents in *H.A.* already serve exactly the same purpose?

**Abstracts should be fuller.**

This is largely a space problem.

**Mycological and entomological abstracts might be omitted.**

When the editor visited clients overseas in 1950/51 this suggestion was made at places in Canada and Australia, primarily as a means of making room for review articles. It was, however, strongly opposed, not by the editor, but by others present who urged that our approach to plant protection problems was different to that of the institutes and that our abstracts in this field were undoubtedly of value. All, perhaps, that we can add is that it will be a happy but very remote day when horticulture can finally be divorced from pathology animal, vegetable or mineral.

## SALIENT ITEMS. Vol. 24. No. 4.

### MACHINERY AND EQUIPMENT.

**Machines and implements:**—In France a cabbage planter has been converted for use in planting nursery trees (3435), while in Germany a tractor-operated shovel can dig a tree hole in 40 seconds (3437). A tractor-mounted cultivator for working under trees is described from Australia (3509) and turf-aerating implements from Britain (4121). Experience with hop picking machines in England is surveyed (4047). From America come descriptions of an improved castor bean huller (4061), a guayule air pressure thresher (4056) and a new coffee scrubber and washer (4334). The subject of seed cleaning and its machinery is reviewed (3438), and two papers, noted by title only, deal with machinery developed for use in vineyards (3572 l, 3572p).

**Fruit graders:**—The fruit, by its own weight, provides the power necessary to operate a German-Dutch grader (3532). In California a new grading table permits faster and easier sorting of lemons (4244). Tests on four grading machines are reported from Switzerland (3533).

**Sprayers:**—Two papers concern respectively a report on a Danish mist sprayer in England (3688) and observations on four such machines in Germany (3687).

**Tools and apparatus:**—Subjects of papers mentioned briefly include from South Africa two new rain guages (3434), from Britain a trap for catching flies trying to enter mushroom houses (3875), from Bulgaria apparatus for estimating the essential oil contents of plants (4016), and from America a leaf sampling punch (3433), a seed-insecticide mixer (3686), a mechanical nomograph for measuring sex expression in castor beans (4059) and a nutcracker for macadamia nuts (4254).

**Glasshouses:**—The N.I.A.E. in England has designed a new mobile glasshouse (3425), and a leading American authority on practical plant propagation describes an ideal propagating house (3428). Other papers deal with the use of saran material (3429), the protection of glasshouses and lights from hail (3427) and, noted by title only, a hot air heating system (3443t) and the calculation of fuel demands (3443m).

## MALEIC HYDRAZIDE.

A growth inhibitor which appears able temporarily to slow down or stop growth processes in plants without producing any very obvious adverse effects is bound to arouse considerable interest. Its practical possibilities, some of which are reviewed in one paper (3387), would appear to be considerable. Other papers deal with the following specific applications: preventing sprouting in stored onions (3880), retarding seed stalk development in celery (3820), controlling suckering in tobacco (4490), retarding withering of magnolia flowers (4154), and its behaviour as an anti-auxin when applied to cacao flowers (4301). Attempts to retard flowering in raspberries and thus reduce damage from spring frosts have not as yet had very encouraging results (3546). Mention might also be made of another growth inhibitor, *iso*nicotinic acid hydrazide whose effects on several plants are described and compared with those of maleic hydrazide (3385).

## PLANT NUTRITION—SOME ASPECTS.

**Tree composition:**—The use of foliar analysis is considered for three tree crops, namely apples (3514), oil palms (4351) and rubber (4359); results reported in the first of these indicate the need to consider both sampling position and the bearing condition of the tree in interpreting results. Another paper on the nitrogenous constituents of young apple trees discusses the need for a new test for N fertilizer needs based on variations in the amount of soluble N present (3507). A study of the composition of coffee roots reveals seasonal changes in carbohydrates which may throw light on the causes of biennial bearing (4330).

**Foliar nutrition:**—In addition to a review article (3411) information is provided on the responses to urea and other nutrient sprays of cabbages (3802), cacao (4296, 4298), deciduous fruit trees (3502), gladioli (4105), tobacco (3974, 3975) and tomatoes (3925). A study with radioactive phosphorus suggests that stage of growth, time of day and atmospheric humidity may all affect the response (3412). Modifications of the foliar nutrition technique are the application of urea to cacao flowers to improve fruit set (4297) and the application of calcium to the heart of celery plants to control blackheart disorder (3823).

**Injection for curative purposes:**—With coconut palms the best site for liquid injection proved to be the cut ends of mature functioning roots (4314).

**Molybdenum:**—There are fashions in minor elements, and at present pride of place seems to be occupied by molybdenum. This is no doubt largely due to the discovery that a complex interrelationship exists between Mo and N (3806, 3903, 3929). Other papers are included on soil factors affecting Mo uptake (3807), Mo deficiencies in peas (3846, 3847), brassicas (3805) and tobacco (4490) and the effect of Mo on tomato enzymes (3928). Two reviews may also be mentioned (3405, 3406), and a new polarographic method of estimating Mo (3389).

**Uncommon aspects:**—The effect of manuring on nectar secretion was positive in one investigation (3414) and negative in another (3541). Among less familiar elements and compounds applied to plants are aluminium (4074), a toxic form of nitrogen called biuret (4167), lignite (3404), silicates (3926) and yttrium (3407), whatever that may be.

## PLANT PROPAGATION.

**Seed:**—Two papers are concerned, respectively, with the effects of pre-soaking before stratification on the after-ripening and germination of *Malus* and other seeds (4141) and with the effect of the seed-coat in hindering the germination of apple seeds (3459). The essential role of the cotyledons in germination has been demonstrated in peach seeds (3461). Other papers deal with the effects of IAA and amino acids on the growth of *Datura* embryos (4010, 4011), the inclusion of growth substances in pelleted seeds (3771), methods of germinating manila hemp seeds (4031), hastening germination of *Raphia* seeds by paring away the seed-coat (4038), and, in the "give 'em hell" class, stimulating germination in vegetable seeds by subjecting them to high-frequency vibration and ultrasonic noises (3371).

**Cuttings:**—That nature may sometimes protect herself from the careless nurseryman is suggested by a trial in which cuttings from virus-infected tobacco plants did not root so well as those from healthy plants (3988). There are further reports of the good effects of treating cuttings with adenine (3463) and fungicides (4291). Losses of cuttings through stem rots may also be minimized by allowing only their tips to rest on a saturated rooting medium (4070). Other papers on cuttings concern apples (3462), cabbages (3800), cacao (4290), cape gooseberries (3542), figs (3464), gerberas (4093), guavas (4346), *Rauwolfia* (4012), tomatoes (3920) and isolated leaves of several species (4071).

**Grafting:**—Mention may be made of a micro-grafting technique applied to tobacco radicles (3968) and of further tests with machine grafting of vines (3562) and coffee (4328).

**Marcotting:**—The mist system, now quite widely used to root cuttings, has been successfully applied to the hardening-off of litchi marcots (4251).

**Storage of budwood and cuttings:**—Studies have shown that both unrooted and rooted cuttings of carnations and chrysanthemums can be stored for long periods (4082, 4087). Sugar cane cuttings kept for a period in dry storage "germinated" better than fresh material as the result of changes in available carbohydrate supply and possibly also in auxins (4373). Cacao budwood is less amenable to storage but can be kept for a week in charcoal (4292).

## ROOTSTOCK-SCION RELATIONSHIPS

**The uniformity of clonal rootstocks:**—The discovery that a proportion of the individuals in certain apple rootstock clones have been carrying virus diseases (3589) must have come as something of a shock to pomologists who considered the use of clonal rootstocks to have eliminated one major source of variation between trees. Other factors which may cause variation in the performance of certain apple and citrus stock-scion combinations are the height of budding (3466, 4189) and perhaps the actual budding technique (4188).

**Rootstocks *vs.* own roots:**—Papers contributing to a knowledge of this subject relate to apples (3472), grape vines (3560) and roses (4132).

**The effect of intermediates:**—Future developments may be worth watching in a trial on avocado pears in which "juvenile" seedling intermediates appear to be exerting a dominating influence when inserted between "mature" clonal root and stem components (4165). Histological studies on the unions formed by an intermediate in pear–quince combinations formed by "double-shield budding" may also be mentioned (3468).

**Interspecific and intergeneric combinations:**—Apparently successful grafts are recorded between different solanaceous species (3941, 3947), between *Achras* and *Mimusops* (4445), and between monocots of different genera (3356).

**Inarching:**—A study of apples shows that it takes many years for the effects of inarched stocks to become evenly distributed among scion branches (3467).

## ULTRA, INFRA AND OTHER RADIATIONS.

**X-rays:**—Not content with his atoms the physicist is increasingly invading the botanical field. Not only are X-rays used to cause mutations in plants (3453, 3842), but, applied to mother pollen cells, they can be used to induce self-fertility in fruit trees (3451). Their effects on microspores is also being investigated (4098).

**Gamma-rays:**—$\gamma$-rays from a cobalt 60 source are claimed to afford an even more pliable method of inducing mutations in fruit trees than X-rays (3452).

**Light rays:**—The many applications of ultraviolet and infrared rays to the processing of fruits are reviewed (3336), and the use of the former to reduce brown rot in apricot fruits is reported (3614). Another use for ultraviolet rays is to make smog markings on plants fluoresce and thus distinguish them from markings due to other causes (3588).

**Ultrasonic vibrations:**—These have been shown to stimulate growth (3372) and, as already mentioned above, seed germination (3371).

**Electrons for pest control:**—Electrons have proved lethal to weevils infesting beans, but they also upset the beans (3334).

## WATER RELATIONS AND IRRIGATION.

**Water relations:**—Mention of this subject may serve to draw attention to the curious lack of interest shown in it by many research organizations. Only four papers deal specifically with the subject. One is concerned with the effects of soil moisture stress on carbohydrate development in beans and tomatoes (3860). Another reports the total water consumption during growth and per unit of dry matter for the same two crops (3917). The third paper relates water requirement to growth phase in tobacco (3977), and the fourth is concerned with the water relations of the kapok tree (4030).

**Evapotranspiration:**—A single paper is devoted to a critical discussion of existing methods of calculating evapotranspiration with particular reference to records obtained in the Netherlands (3363).

**Irrigation:**—Two bulletins from the Ministry of Agriculture in London may be mentioned, one dealing with the subject in a general way and the other devoted to methods of calculating irrigation needs (3420, 3421). The calculation of soil moisture levels in greenhouse tomato culture is the subject of another paper (3918) and five others deal with irrigation practice or experiments applied to various crops in the open or under glass (3422, 3513, 3978, 4133, 4191).

## MISCELLANEOUS.

**Approaching milk shortage**·—It is reported that a virus in a plant has been inactivated by applying diluted milk (3935). Other substances showing "curative" properties are an extract from an actinomycete (3985) and the juice from another species of plant (3952).

**Artificial illumination of plants:**—Attention may be drawn to several interesting papers on this subject, one on types of lamp (3430), one on the responses of cucumbers (3827) and five on the responses of tomatoes (3910 *et seq.*).

**Bird scarer:**—An imitation hovering hawk fooled starlings (3662).

**Botanical oddity:**—Readers with a taste for the botanically bizarre may be confidently recommended to look at abstract 4161.

**Fusarium wilt of tomatoes:**—Experiments indicate that a toxin or toxins are translocated in advance of the pathogen (3941) and it would seem that the action of these toxins is due, at least in part, to their capacity to form metal chelates in the plant (3409, 3410). The ability of wilt-resistant varieties, but not of susceptible varieties, to form adventitious roots in response to metabolites of the pathogen may be of significance in relation to the mechanism of disease resistance (3942).

**Group spacing of crops:**—The Russians have for some time advocated planting annual crops on the square in groups. Two more papers claim advantages when the method is used for vegetable crops (3770) and tobacco (3970).

**Leaf size measurement:**—A method based on leaf photographs is described from Australia (3350).

**Oil sprays:**—Plant protection chemists may find material of interest in three papers on comparisons between naphthenic- and paraffinic-type oils applied for the control of citrus pests (4232-4234).

**Poisonous pots, etc.:**—Cases are recorded of pots made of highly alkaline material proving toxic to their occupants (3431). Certain wood preservatives should also be kept well away from plants (3442).

**Soil fumigation simplified:**—By combining the liquid fumigant with a silica or vermiculite carrier and then applying it with a fertilizer drill (3418).

**Soil sickness:**—Investigations are reported on apples (3582), apples and plums (3581) and asparagus (3795).

**Statistical design and analysis:**—In addition to the section devoted to this subject (3339-3346) attention may be drawn to two papers on sugar cane. One of these is concerned with sampling for maturity testing (4397) and the other criticizes present day concepts of experimental error and statistical significance (4365).

**Tree growth measurements:**—Recorders of tree growth should be interested in correlations between growth ring size and other tree measurements (3485) and in a study on the height at which trunk girths should be measured (3486).

**What's in a name?**—An American committee has proposed a system of nomenclature for growth substances (3375). A Canadian has proposed a new method of citing scientific references (3331), but no startling innovations may be expected in *H.A.* in the near future.

# MISCELLANEOUS.

### *General.*

3324. Ministry of Agriculture, London.
*Agricultural Statistics 1950-1. England and Wales—Part I.* H.M.S.O., Lond., 1954, pp. 139, 5s. 6d.

Details are included on the following: 1. Acreages of the main vegetables grown for human consumption in the chief growing counties and of crops under glass and flowers in 1950 and 1951. 2. Production (yield per acre and total yield) of vegetables under glass and in the open for the period 1941 to 1951. 3. Orchard fruit acreage and numbers of trees per county in 1951, and acreage of small fruit per county for 1950 and 1951. 4. Production of fruit of all kinds in England and Wales in the period 1941 to 1951.

3325. Ministry of Agriculture, London, Department of Agriculture, Edinburgh, and Ministry of Agriculture, Belfast.
*Agricultural Statistics 1952. United Kingdom—Part I.* H.M.S.O., Lond., 1954, pp. 38, 2s. 6d.

The bulletin contains horticultural data on: 1. Land returned as used for fruit growing in England and Wales, Scotland, Northern Ireland and total for the U.K. 1943-1952. 2. Area under small fruit 1951 and 1952. 3. Production of fruit 1942-1952. 4. Acreages of vegetables, including those grown under glass, and of flowers in 1951 and 1952. 5. Production of vegetables 1942–1952. Data are also included on agricultural workers 1943–52, agricultural machinery 1950 and 1952 and agricultural holdings 1943–1952.

3326. U.S. DEPARTMENT OF AGRICULTURE.
**Foreign agricultural situation. Maps and charts.**
[*Publ.*] *U.S. Dep. Agric. foreign agric. Serv.*, 1953, pp. 62, illus., 35 c.

Maps and charts are given of world trade and U.S. production of agricultural products including tobacco, fruits and coffee in 1952–1953. Agricultural exports from the U.S. were the lowest since the war, tobacco declined about 15% and apple exports dropped to about one-third of the previous year; there was an increase in exports of oranges, fresh grapes and raisins.

3327. (HOTCHKISS, J. C.)
**Eastern Caribbean Farm Institute.**
*J. agric. Soc. Trin. Tob.*, 1954, **54**: 29-37.

A summary is given of a broadcast by the Principal of the Institute which was opened in March 1954. The Institute was established by the governments of Barbados, the Leeward Islands, Trinidad and Tobago, and the Windward Islands with the aim of training practical agriculturists for advisory and executive posts during a course of 2 years. The Institute farm of 135 acres aims to be entirely self-supporting.

3328. INSTITUT NATIONAL POUR L'ÉTUDE AGRONOMIQUE DU CONGO BELGE.
Au service de l'agriculture congolaise. L'Institut National pour l'Étude Agronomique du Congo Belge. Son but, son programme, ses realisations. (**Serving Congo agriculture. INEAC. Its aim, programme and achievements.**)
(*Publ.*) *INEAC*, 1954, pp. 100, illus.

An account is given of INEAC, its general organization in Europe and Africa, and the crops and research programmes of its 40 centres. Maps show the vegetation, soils, and climatic zones of the Congo and the location of INEAC centres. There is a plan of the Yangambi Research Centre.

3329. ANON.
Les activités agronomiques de la Station de Keyberg. (**The agronomic work of the Keyberg Station.**)
*Bull. Inf. INEAC*, 1954, **3**: 81-109, illus.

The INEAC station at Keyberg near Elizabethville has a seven-month dry season and an annual rainfall of 1,250 mm. Notes are given on the temperate, subtropical and tropical fruit crops grown and on vegetable growing.

3330. DEKKER, P.
Tuinbouw in Zuid-Slavie. (**Horticulture in Southern Slavia.**)
*Cult. Hand.*, 1954, **20**: 282-8, illus.

The main vegetables grown are onions, garlic, French beans, peas, cabbage, tomatoes, paprika and melons; many tomatoes are processed and exported, and paprika is also exported to a large extent. Plums are the most important fruit grown, both for the home and export markets; apples, pears, cherries and grapes are also produced. Ornamental plants are grown near the larger towns, but not on a large scale.

3331. MCCASLAND, G. E.
**A concise form for scientific literature citations.**
*Science*, 1954, **120**: 150-2.

A new method of citing scientific references which would approximately halve the linear space required is of the greatest interest to scientist and librarian alike. The method described here has obvious advantages especially, it is suggested, for use with automatic sorting devices for punched cards. [It might, however, present considerable difficulties to the ordinary reader who has not the facilities of a library or the essential key.]—Dep. Chem., Univ. Toronto.

3332. (MARTÍNEZ, A., AND NOËL JAMES, C.)
Lista de revistas agrícolas latino-americanos; preliminar. (**Preliminary list of Latin American agricultural journals.**)
*Informe final Reunión téc. Bibl. agric. America latina*, Vol. **2**, 1953, pp. 92-115.

A preliminary list is given of 311 agricultural journals currently published in Latin America. The two countries with the largest output are Argentina with 59 and Brazil with 55 periodicals.

3333. WARTENBERG, H., AND OTHERS.
Phytopathologische Vortragsreihe. (**Phytopathological lectures.**)
Reprinted from *Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg*, 1953/54, **3**: 99-108.

The series includes the following lectures: Wartenberg, H., Causes of chlorosis in plants, pp. 99-100; Rademacher, R., Topical questions in weed science and weed control, pp. 101-2; and Stapp, C., The present state of our knowledge on plant tumours, pp. 105-6.

3334. BAKER, V. H., TABOADA, O., AND WIANT, D. E.
**Lethal effects of electrons on insects which infest wheat, flour, and beans—Part II.***
*Agric. Engng St. Joseph, Mich.*, 1954, **35**: 407-10, bibl. 11, illus.

Tests conducted on Michigan navy beans infested with *Acanthoscelides obtectus* show that an electron dose of 10,000 rep. provided by the Van de Graaf electron accelerator, was lethal to all adult bean weevils one week after treatment. The dosage was detrimental to seed germination. Literature on the effects of accelerated electrons on vitamins and enzymes is reviewed.

3335. BERGANN, F.
Über den Schädlingsbefall von Chimärenfrüchten. (**On the infestation of chimaera fruits by pests.**)
*Planta*, 1954, **43**: 411-19, bibl. 17.

The fruits of *Crataegomespilus asnieresii* are often infested by *Syntomaspis druparum*, though to a lesser degree than the fruits of *Crataegus monogyna*, while those of the other component of the chimaera, *Mespilus germanica*, are never attacked. The implications of these findings are discussed.—Karl Marx Univ., Leipzig.

3336. NAVELLIER, E.
Utilisation des rayons ultraviolets et infrarouges dans l'industrie fruitière. (**Use of ultraviolet and infrared rays in the fruit industry.**)
*Fruits d'Outre Mer*, 1954, **9**: 70-6, 212-17, bibl. 12, illus.

---

* For Part I see *Agric. Engng St. Joseph Mich.*, November, 1953.

*Ultraviolet rays.* Colouring apples, tomatoes and citrus; stamping fruit skins; maturing dates and vanilla pods, sterilization of air, of fruits, of water and fruit juices, and of containers; stabilization of wine and cider; detection of fruit diseases and of adulterants in essential oils; use in chromatography. *Infrared rays.* Dehydration of fruits; curing cacao and coffee; preheating fruit juice bottles; sterilization of cans and lids; drying of labels on bottles; frost control; tulip forcing; disinfestation of chestnuts and vanilla pods; humidity control in laboratories.

3337. MANN, G.
**The control of relative humidity in cold stores. 1. The loss of water from perishable produce during storage.**
*Food Invest. Mem. D.S.I.R.*, Lond., **850**, 1954, pp. 15, bibl. 7.

In this paper are discussed the conditions of storage considered best suited to certain commodities, store conditions affecting water evaporation from produce and methods by which the humidity of existing stores might be modified, with particular reference to fruit and vegetables.

3338. (NICOLAISEN, N.)
Blütenpollen—Erhaltung seiner Keimfähigkeit durch Kaltlagerung. **(Pollen—the preservation of its viability by cold storage.)**
*Industr. Refrig.*, Oct. 1953, from abstr. in *Saatgut-Wirtsch.*, 1954, **6**: 119.

Hundreds of pollen samples of annual plants and olives were successfully stored at −18° C. from one season to another. This method of low temperature storage, which appears to be applicable to pollen from a wide range of plants, promises to be useful in breeding. In pollen germination tests the best results were obtained on freshly prepared agar and in Petri dishes kept closed to avoid moisture loss.

### *Experimental design.*

(*See also* 3443e, f, 3508, 4460.)

3339. HOPP, H.
**A guide to extensive testing on farms. Introduction. Result tests. Farm experiments. Using data to design extensive tests on farms.**
[*Publs*] *U.S. Dep. Agric., foreign agric. Serv.*, 1954, Parts I and II pp. 27, illus., Part III pp. 69 and Part IV pp. 35.

This treatise describes methods suitable for testing on farms (extensive testing) the results of experiments carried out at research stations (intensive testing). The statistics are reduced to simple rule-of-thumb methods which, with the exception of some in Part IV, are set out in a form suitable for the layman to follow; no attempt is made to explain the theory, but references are given.

*Part I—Introduction.* The author draws attention to the several types of problem concerned with applicability of research station results, which can only be solved by extensive testing under farm conditions. He distinguishes between the result test, which is one undertaken to test the result under farm conditions of a single practice, and the farm experiment which is designed to test which of a number of practices is the best.

*Part II—Result Tests.* The various points to consider in setting up a result test are outlined in the following seven steps: (1) Defining and delimiting the regions of applicability. (2) Deciding on the number of farms in each region to be used; a table is given to assist in this. (3) Selecting the farms to be used, which should be done as nearly at random as possible. (4) Deciding whether check plots are needed or not. (5) Marking out the actual plots, again as nearly at random as possible. (6) Collecting the data. (7) Interpreting the results; examples of statistical analyses are given.

*Part III—Farm Experiments.* Farm experiments are recommended chiefly for finding the regional applicability of practices thought to be effective, and guidance is given on the three stages of selecting a plan, deciding on the number of farms and field procedure.

*Part IV—Using data to design extensive tests on farms.* Three methods are described of estimating plot, location and treatment variability, these being improvements on the rough and ready methods of Parts II and III. Method I is suitable for estimating plot or location variability from survey data obtained either previously or specially for the purpose. It does not necessitate a calculating machine, and consists of estimating a standard error from the median deviation between neighbouring plots. Method II is appropriate to the same circumstances as Method I, but estimates the standard error from the sums of squares of differences. Method III may be used for estimating plot, location or treatment variability from data of experiments carried out in the area concerned, the usual analysis of variance techniques being used to estimate the separate variance components required.

The two concluding sections deal respectively with modifying an estimate of plot variability where this is derived from small experimental plots, and with a means of determining the best size of plot.
G.M.J., and G.H.F.

3340. JACOB, W. C.
**Some general considerations of plot technique in horticulture.**
*Proc. Amer. Soc. hort. Sci.*, 1953, **62**: 35-45, bibl. 101.

A bibliography of 101 references is presented with comment and discussion. [There is a strong bias to the North American literature, but attention is drawn to a number of little-known publications.] S.C.P.

3341. POTTER, G. F.
**Field plot technique for tree crops.**
*Proc. Amer. Soc. hort. Sci.*, 1953, **62**: 4-13, bibl. 10.

The crop chiefly considered is tung, but the approach is of much wider application. Attention is given to general considerations, such as independence of successive years' results, as well as to specific devices, such as confounding and lattice designs. Finally, size and shape of plots are discussed as well as the use of measurements made before the application of treatments. S.C.P.

3342. KOCH, E. J.
**Plot technique in small fruits.**
*Proc. Amer. Soc. hort. Sci.*, 1953, **62**: 14-20, bibl. 4.

Randomized blocks are recommended as a general rule but lattice designs and split-plots are considered useful in many cases. Treatments should be selected with care and should often be factorial, but they should not be too numerous or too diverse in expected performance. Some data are presented on plot size with strawberries. S.C.P.

3343. Lana, E. P., Homeyer, P. G., and Haber, E. S.
**Field plot techniques in vegetable crops.**
*Proc. Amer. Soc. hort. Sci.*, 1953, **62**: 21-30, bibl. 10.

Attention is concentrated on the best size and shape of plots, conclusions in the literature being summarized for potatoes, tomatoes and broccoli. Results from uniformity trials on onions and sweet potatoes in Iowa are presented, and the point is made that variability is seriously high even under good conditions. S.C.P.

3344. Federer, W. T.
**Plot technique in greenhouse experiments.**
*Proc. Amer. Soc. hort. Sci.*, 1953, **62**: 31-4, bibl. 11.

Sources of error, such as temperature gradients, shading effects and moisture differentials, are mentioned. Variation can be reduced by allowing for the initial bioelectric potential of the plants. It is emphasized that treatments must be chosen carefully, as must the size and shape of plots. Also a trial that is adequate to show differences in one characteristic of the plants may not suffice for another. Some treatments can only be applied to whole greenhouses, and it is then necessary to use several houses, possibly so that each treatment is applied successively in each. In other cases plots as small as a single plant may be possible, but hardly where plant-to-plant variation is large. In conclusion, the point is made that greenhouses should be adapted to meet experimental needs, not *vice versa*. S.C.P.

3345. Finney, D. J.
**Response curves and the planning of experiments.**
*Indian J. agric. Sci.*, 1953, **23**: 167-86, bibl. 3.

This comprehensive paper deals with the relationships to be found between the levels of application of fertilizers under test and the responses in yield to be obtained from them. After discussing various ways in which this relationship has been expressed in the past, the author concludes that the only really satisfactory way is to graph one against the other. No assumption is made as to the shape of the resulting "response curve", beyond the elementary one that, over any range that might reasonably be investigated, added fertilizer always increases the yield, but the degree to which it does so falls off as the level increases. As to the number of levels to be investigated, the author considers that at least three are needed in order to get the general shape of the response curve, but that more than four are undesirable. He stresses the desirability of information about the upper reaches of the response curve, and, if the optimum dressing is expected to be about $x$, he recommends testing levels of 0, $1{\cdot}25x$, $2{\cdot}5x$ or 0, $0{\cdot}8x$, $1{\cdot}6x$, $2{\cdot}4x$ rather than lower ones more closely grouped about the expected optimum. The curve thus obtained, he shows how to determine the most profitable dressing and points out the irrelevance to practical needs of the point of maximum yield. In comparing forms of fertilizer he gives a warning against testing them all at a high level, for then the plants will probably get enough whatever the form; instead he recommends finding out from the response curves how much of one form is equivalent to a unit of the other and comparing prices, though other approaches are possible. He also discusses the interaction of factors and the number of them that should be investigated together in one experiment. S.C.P.

3346. Gomes, F. P.
**The use of Mitscherlich's regression law in the analysis of experiments with fertilizers.**
*Biometrics*, 1953, **9**: 498-516, bibl. 11.

This is a study related in subject matter to that of abstract 3345 above but more mathematical in approach. Given an experiment in which a certain fertilizer is tested at several levels, it provides a means for testing (i) if the relationship between amount applied and resulting yield is in fact that given by the formula Mitscherlich, and (ii) if so, what the yield should be for any other rate of application. Attention is also given to finding the most profitable level of a fertilizer. S.C.P.

## *Botany.*

3347. Cuénod, A., Pottier-Alapetite, G., and Labbe, A.
Flore analytique et synoptique de la Tunisie. Cryptogames vasculaires, gymnospermes et monocotylédones. **(Analytical and synoptic flora of Tunisia. Vascular cryptogams, gymnosperms and monocotyledons.)**
[*Publ.*] *Off. Exp. Vulg. agric. Tunis.*, 1954, pp. 287, illus., maps.

This volume covers some 470 species. The information given for each consists of botanical name and synonyms, description, flowering season, habitat in Tunisia, and general geographical distribution. The illustrations are few and small and no scale is given.

3348. Polunin, N. [Editor], and others.
**The cryptogamic flora of the Arctic.**
*Bot. Rev.*, 1954, **20**: 361-476, bibls.

Six papers, each with a separate list of references, are presented covering algae, (i) planktonic and (ii) non-planktonic, bacteria, bryophytes, fungi and lichens.

3349. Roll-Hansen, J.
**Definition of the terms cultivar and strain.**
*Acta Agric. Scand.*, 1954, **4**: 237-8.

The author suggests definitions of the terms cultivar and strain based on the "International Code of Nomenclature for Cultivated Plants" edited by W. T. Stearn [*H.A.*, 23: 3703]. A cultivar includes a clone or several apparently identical clones, one or more strains, and one or more line-hybrids coming within the cultivar's range of characteristics. A strain within a cultivar consists of one or more pure lines, and one or more pure families.

3350. Williams, R. F.
**Estimation of leaf area for agronomic and plant physiological studies.**
*Aust. J. agric. Res.*, 1954, **5**: 235-46 plus 10 plates, bibl. 6.

A method based on leaf photographs is described for the estimation of leaf area. The method of preparing the standards is given, and a set of standards covering the full range of leaf form in young plants of the Pearson variety of tomato is presented. The method is rapid and does not damage the experimental plants. With five observers, the method was tested for the presence of bias resulting from fatigue or from variation in leaf size or form. Some of the observers showed personal idiosyncrasies of judgment which did not, however, invalidate the method for comparative studies. Estimates by all observers of leaf area per plant were very highly correlated with estimates based on an independent reference method. [Author's summary.]

3351. Moore, P. G.
**Spacing in plant populations.**
*Ecology*, 1954, **35**: 221-7, bibl. 11.

A method of examining the randomness in plant populations is presented. This method uses numerical studies based on the spacing between the plants in a large area.

3352. Cannon, W. A.
**A note on the grouping of lateral roots.**
*Ecology*, 1954, **35**: 293-5, bibl. 5.

In this note consideration is given chiefly to the order of branching of roots of herbaceous and woody plants as related to (*a*) the type of "root-bough" and (*b*) environment. Under conditions of high soil moisture the ultimate order of branching is low whereas in relatively dry soil it is high.

3353. White, D. J. B.
**The development of the runner-bean leaf with special reference to the relation between the sizes of the lamina and of the petiolar xylem. I. The relation between lamina area and petiolar xylem.**
*Ann. bot. Lond.*, 1954, **18**: 327-35, bibl. 5, illus.

An investigation has been made of the relation between the sizes of the lamina and of the petiolar xylem of both mature and immature leaves of the runner bean (*Phaseolus multiflorus*). The ratios xylem area/lamina area and the number of vessels/lamina area are lowest for mature leaves. Immature leaves gave higher but somewhat more variable values for these two ratios. There is a constant growth ratio between the lamina area and the xylem area. [From author's abstract.]

3354. White, D. J. B.
**The development of the runner-bean leaf with special reference to the relation between the sizes of the lamina and of the petiolar xylem. II. The normal development of the bean leaf.**
*Ann. bot. Lond.*, 1954, **18**: 337-47, bibl. 3.

The development of the first pair of leaves of the runner bean (*Phaseolus multiflorus*) has been investigated from the unfolding of the leaves to the end of lamina expansion. The growth of the petiole is relatively fast and ceases first: extension growth of the lamina continues longer. In the growth of the xylem, the average area of vessels formed increases most markedly at an early developmental stage. Vessel number may continue to increase after lamina growth has ceased. Both the number of vessels and the xylem area per unit area of lamina diminish as the leaf matures. [Author's abstract.]

3355. Mosse, B.
**Studies on the endotrophic mycorrhiza of some fruit plants.**
[*Typed*] *Ph.D. Thesis London University*, 1954, pp. 120, bibl. 45, illus.*

The author discusses three main pieces of work, namely: (1) A study of mycorrhizal infection in apple. (2) An attempt to compare the growth of mycorrhizal and non-mycorrhizal plants and to record anatomical differences in mycorrhizal development under different manurial conditions—strawberries and apple seedlings being used. (3) Inoculation experiments arising from the discovery of fructifications organically connected with mycorrhizal strawberry roots.

3356. Muzik, T. J., and LaRue, C. D.
**Further studies on the grafting of monocotyledonous plants.**
*Amer. J. Bot.*, 1954, **41**: 448-55, bibl. 10.

Grasses and lianas were used. Grafts are described between some of the tropical lianas and intergeneric unions were obtained between *Nephthytis afzelii* and *Scindapsus aureus*. The phenomena are noted.—Mayaguez P.R. and Ann. Arbor., Mich.

3357. Schwanitz, F.
Einige Beobachtungen zur Blütenbiologie und zur Sexualität diploider und polyploider Gigaspflanzen. (**Observations on the flowering biology and sexuality of diploid and polyploid gigas plants.)**
*Gartenbauwiss.*, 1954, **1**†: 73-90, bibl. 11, illus.

The plants studied include diploid or polyploid gigas forms of raspberry, tomato and other *Lycopersicum* spp., *Bryophyllum tubiflorum*, and *B. daigremontianum*, *Bellis perennis*, *Digitalis purpurea* and *D. lanata* and celeriac. The changes observed in diploid gigas forms were similar to those commonly occurring in polyploid forms, such as reduction in the number of flowers, delay in flowering, reduction in the number of fruits set and seeds developed, etc. With both diploid and polyploid gigas plants the life of the individual flower was prolonged. In tetraploid *B. tubiflorum* plants the inflorescences showed a strong tendency to turn green. —Max Planck Inst. f. Züchtungsforsch.

3358. Chakravarti, S. C.
**Anatomical studies in relation to vernalisation.**
*Indian J. agric. Sci.*, 1953, **23**: 289-300, bibl. 30, illus.

Studies on plants from vernalized seeds of *Brassica campestris*, *Eruca sativa*, *Lens esculenta*, *Cicer arietinum*, *Lathyrus odoratus* and *Pisum sativum* showed that treated plants were in a more mature anatomical condition than unvernalized plants of the same age.

3359. Savinskiĭ, P. I.
**A dry method of preserving the form and natural colour of plants (flowers, leaves, fruits, roots and tubers).** [Russian.]
*Bot. Žurnal*, 1954, **39**: 101-2, illus.

---

* Available in the library of the East Malling Research Station, Maidstone, Kent.

† New series. Vol. 18 was published in 1945.

The method described consists of providing the specimens with a protective coating which causes evaporation during drying to proceed from the centre, thus preserving shape and life-like appearance. With leaves the upper surface is smeared with paraffin while the lower surface is treated with a 2 mm. layer of plaster mixture, consisting of two-thirds plaster+one-third sand (by volume)+15% solution of joiners' glue or white of egg, and then dried. Some flowers can be treated similarly. Fruits and roots, with one-third of the side cut off, are first smeared with resin+paraffin and then cased in plaster. The flesh, except in the case of very juicy berries, is removed and the cavity is dried out with salt. When completely dry, the inside is coated with gelatine or glue, the plaster is removed and the whole specimen is lacquered.

### *Physiology.*

(*See also* 3443c, d, j, k, q, r, x, z, 3444e, 3911-3917, 3997, 4218.)

3360. Brown, A. H., and Frenkel, A. W.
**Photosynthesis.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 23-58, bibl. 195.

In this review the authors discuss five topics of research in photosynthesis, namely its effect, the biochemical pathway of carbon during photosynthetic assimilation, enzymes directly implicated in the photosynthetic process, photosynthesis and P metabolism, and the source of photosynthetic oxygen. The survey of the literature for this review was concluded in December 1952.

3361. Lumry, R., Spikes, J. D., and Eyring, H.
**Photosynthesis.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 271-340, bibl. 401.

In this review, based on a previous one by the same authors in 1953, emphasis is placed on the newer findings concerning the photochemistry of photosynthetic pigments, chloroplast structure and composition, energy transfer mechanisms, the Hill reaction and its relation to photosynthesis. The review concludes with a very brief discussion of the most recent work on other aspects of photosynthesis.

3362. Daly, J. M.
**Stimulation of respiration by carbon monoxide.**
*Arch. Biochem. Biophys.*, 1954, **51**: 24-9, bibl. 13.

Carbon monoxide has been found to increase, rather than inhibit, gas uptake in wild plum (*Prunus americana*) leaf tissue. By means of isotopic carbon monoxide it has been possible to show that the increase results from higher respiratory rates rather than oxidation of carbon monoxide to carbon dioxide. The implications with respect to the Pasteur reaction are discussed briefly. [Author's summary.]

3363. van Wijk, W. R., and de Vries, D. A.
**Evapotranspiration.**
*Neth. J. agric. Sci.*, 1954, **2**: 105-19, bibl. 15.

The existing methods of calculating evapotranspiration are discussed. No method based on monthly temperatures can be expected to give reliable results for different regions. The temperature of the air lags behind solar radiation at moderate and high latitudes and, therefore, the amount of energy available for evaporation in the spring is quite different from that available in the autumn, if periods with the same temperature are compared. For the Netherlands, for instance, this difference amounts to nearly 300% between the two months of March and November, with average temperatures of 5·0° and 5·4° C. respectively. Further discrepancies occur in the case of cold or warm ocean currents, and low temperature owing to elevation. The energy available for evapotranspiration can be calculated by applying the theory of heat exchange (including radiation) to a wet body of the same shape as the vegetation cover. Actual evapotranspiration will be smaller than the calculated maximum value by a factor depending on the physiology (not the morphology) of the plants. [Authors' abstract.]

3364. Brauner, L.
**Tropisms and nastic movements.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 163-82, bibl. 38.

In the four years since the last review on plant tropisms [see *H.A.*, 20: 2211] progress has been relatively modest. In this review recent experiments and the resulting hypotheses on phototropism, geotropism and thermonasty are fully discussed. The author feels that recent work in this field shows a change in the basic concept of active plant movements in that, although the dependency of motion on auxin interaction is still stressed, the necessary differences in auxin concentration are considered to be brought about by the direct or indirect action of the stimulus, which causes an asymmetric destruction or formation of growth substances.

3365. Samish, R. M.
**Dormancy in woody plants.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 183-204, bibl. 147.

The literature on dormancy in woody plants is discussed in this review under the following headings: the definition of dormancy, description of the rest phenomenon, organs and their interaction, processes associated with rest, and the physiology of rest as applied horticulturally.

3366. Burström, H.
**Physiology of root growth.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 237-52, bibl. 83.

This review is based mainly on literature published from 1950 to May 1952, discussed under the following headings: normal growth of intact roots, action of artificial growth regulators, growth of isolated roots, and root initiation.

3367. Nitsch, J. P.
**The physiology of fruit growth.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 199-236, bibl. 370.

The work on growth processes of tissue supporting plant ovules is discussed, starting from the flower primordia but not including fruit ripening or pollen physiology. The literature study for this review was completed in November 1952.

3368. Pentzer, W. T., and Heinze, P. H.
**Postharvest physiology of fruits and vegetables.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 205-24, bibl. 101.

An attempt is made to evaluate pertinent results published since a previous review in 1950 [see *H.A.*, 20: 3365], with particular emphasis on the rôle of volatile emanations in certain physiological diseases. The subject matter is treated under the following headings: functional diseases related to volatile emanations, volatile emanations and respiration, chilling injury, and the effect of growth substances on post-harvest behaviour.

3369. Allsopp, A.
**Juvenile stages of plants and the nutritional status of the shoot apex.**
*Nature*, 1954, **173**: 1032-5, bibl. 26.

In his reassessment of Goebel's work *Organographie der Pflanzen*, which is partly based on recent experimental studies at Manchester, the author reaches the following conclusions: (*a*) The heteroblastic development of many plants is a consequence of changes in the shoot apex. (*b*) Such changes follow closely any alteration in the nutritional status of the plant, and are usually outwardly visible as changes in the size of the apex. (*c*) In any case of reversion to juvenile leaves, which cannot be accounted for on a nutritional basis, a direct reduction in the size or activity of the apex may be expected.

3370. Sutcliffe, J. F.
**The absorption of potassium ions by plasmolysed cells.**
*J. exp. Bot.*, 1954, **5**: 215-31, bibl. 25.

The absorption of K ions by cells of red beetroot tissue plasmolysed in various media was studied, and the results showed that, although the plasmolysing agents in themselves tended to promote ion absorption at the concentrations employed, both metabolic and total uptake of K declined progressively as the degree of plasmolysis increased.

3371. Barsukov, L. N., and Zabavskaja, K. M.
**The effect of high-frequency vibration on seed germination and plant development.** [Russian.]
*Agrobiologija*, 1953, No. 5, pp. 80-5, bibl. 13.

Application of high-frequency mechanical vibration to seeds, including those of tomato, cucumber, carrot and leek, stimulated germination and seedling growth. Ultrasonic radiation had similar effects.

3372. Newcomer, E. H.
**Observations on dosage, the mechanism of action and the recovery of cells exposed to ultrasonic vibrations.**
*Amer. J. Bot.*, 1954, **41**: 384-9, bibl. 20, illus.

The lowest effective dosage of ultrasonic vibrations producing chromosome breaks in *Narcissus poeticus* root tips was 0·7 watt per cm.$^2$ for 5 seconds; lower doses frequently produced a marked stimulation in growth rate. There was no evidence of recombination or restitution of broken chromosomes or chromatids after treatment.—Univ. Conn., Storrs.

3373. Schuster, G., and Geissler, G.
Untersuchungen über die Möglichkeiten zum frühzeitigen Nachweis von Pflanzenkrankheiten mit Hilfe der Anwelkemethode. I. Mitteilung: Ein Beitrag zur Klärung der Frage nach den Ursachen der sog. Arland-relation. **(On the early detection of plant diseases by the wilting method. I. On the causes of the so-called Arland relation.)**
*NachrBl. dtsch. PflSchDienst, Berlin*, 1954, **8**: 108-16, bibl. 30.

By his wilting method Arland was able to assess the vigour of cultivated plants at an early developmental stage, a low rate of transpiration pointing to favourable growing conditions and a high rate to the reverse. In all cases examined the authors of the present paper found that efficiency (=low rate of transpiration) was associated with a small plant surface in relation to its fresh weight and that a rise in transpiration was accompanied by an increase in the surface: fresh weight ratio. It is hoped to extend the application of Arland's wilting method to the differentiation between healthy and diseased plants before symptoms become manifest.—Karl-Marx-Univ., Leipzig.

3374. Muir, W. H., Hildebrandt, A. C., and Riker, A. J.
**Plant tissue cultures produced from single isolated cells.**
*Science*, 1954, **119**: 877-8, bibl. 14, illus.

Single cells of marigold (*Tagetes erecta* var. Sunset Giant) of crown gall origin, and of tobacco stem (*Nicotiana tabacum* var. Havana 38) were carefully dissected and placed on 8×8 mm. squares of sterile filter paper, which had previously rested on the top of young tissue cultures of marigold, sunflower or tobacco growing on agar. Each filter paper square was returned to a "host", single marigold cells onto marigold or sunflower "hosts", and tobacco onto tobacco "hosts". About 8% of the single cells grew and divided, but needed several removals to new "hosts" to retain their vigour; when about 4 mm. in diameter the cultures resulting from the single cells were removed to agar, where they grew well independently.

## *Growth substances.*

(*See also* 3443b, w, 3496, 3497, 3499-3501, 3539 l, 3546, 3567, section on Weeds and weed control, 3921-3924, 4010, 4128, 4129, 4142, 4154, 4170, 4211, 4212, 4279, 4296, 4291, 4301, 4473.)

3375. van Overbeek, J., and others.
**Nomenclature of chemical plant regulators.**
*Plant Physiol.*, 1954, **29**: 307-8.

A committee consisting of J. van Overbeek, H. B. Tukey, F. W. Went and R. M. Muir has proposed a system of nomenclature for growth substances. The following terms are defined: plant, growth, and flowering hormones; plant, growth, and flowering regulators; auxins; auxin precursors; and anti-auxins.

3376. Zimmerman, P. W.
**Plant growth substances.**
*Encycl. chem. Tech.*, 1953, **10**: 723-36, bibl. 47, illus.

A useful survey in which the author deals with the history of the growth hormones, the chief groups of compounds, detection of activity, responses to growth substances, methods of treating plants and practical application for propagation purposes, preventing fruit drop, inducing parthenocarpy, inhibition of buds, influencing flower formation and weed control.

3377. Veldstra, H.
**The relation of chemical structure to biological activity in growth substances.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 151-98, bibl. 190, illus.

A critical analysis is given of work on growth promoting substances, from a literature survey completed in September 1952. The subject is discussed under the following headings: the importance of the test methods, structure and activity, optical isomerism and activity, activity of non-acidic compounds, antagonistic and synergistic activity of growth substance analogues, and pH and activity.

3378. Gordon, S. A.
**Occurrence, formation, and inactivation of auxins.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 341-78, bibl. 272.

In this review the emphasis is on auxins and related compounds known to exist in plants, the aim being to present an interpretation of the present state of knowledge regarding auxin metabolism in relation to *in vitro* phenomena.

3379. Blackman, G. E., and Robertson-Cuninghame, R. C.
**Interactions in the physiological effects of growth substances on plant development.**
*J. exp. Bot.*, 1954, **5**: 184-203, bibl. 24.

The interrelated effects of 3-indolylacetic acid and sodium 2: 4-dichlorophenoxyacetate on the growth and development of *Lemna minor* and *Helianthus annuus* were investigated by means of multifactorial experiments, involving 3 to 5 levels of each compound. In the *H. annuus* experiments the compounds, in aqueous solution, were placed by means of a micropipette on the leaves of young plants grown in a greenhouse or in the open. The treatments applied to sunflowers were initial application of 0, 20 and 100 µg./plant of sodium dichlorophenoxyacetate and daily applications of 0, 6, 30 and 150 µg./plant of indolylacetic acid in all possible combinations. When each compound was applied alone the leaves above the treated leaves, the first internode, and the roots were depressed. On the other hand, the growth rate of the hypocotyl was increased by both growth regulators, while for the second internode indolylacetic acid decreased the growth rate but the phenoxyacetate at the lower level accelerated it. The combined action of the two compounds on the different parts tended to be cumulative, save for the hypocotyl, where the effect of indolylacetic acid was dependent on the level of the phenoxyacetate. Many of the results can be satisfactorily interpreted on the basis that the two compounds act on a common system and that they compete with one another, but the results are not compatible with the postulate that the dichlorophenoxyacetic acid directly inactivates indolylacetic acid. [From authors' summary.]

3380. Weintraub, R. L., and others.
**Metabolism of 2,4-dichlorophenoxyacetic acid. III. Metabolism and persistence in dormant plant tissue.**
*Plant Physiol.*, 1954, **29**: 303-4, bibl. 16.

2,4-dichlorophenoxyacetic acid applied in autumn, to winter buds of cherry (*Prunus avium*), was partly metabolized to other products during the dormant season and partly remained unaltered until the following spring. [From authors' summary.]

3381. Vlitos, A. J., and Meudt, W.
**The role of auxin in plant flowering. II. Methods for the extraction and quantitative chemical determination of free 3-indoleacetic acid and other indole compounds from plant tissues.**
*Contr. Boyce Thompson Inst.*, 1954, **17**: 401-11, bibl. 11.

Two methods of extracting free 3-indoleacetic acid (IAA) from green plant tissue were compared. It was determined that extraction of quick-frozen, ground tissue with absolute ethanol at −10° C. precluded the conversion of IAA precursors, and removed free IAA from plant tissue with one extraction. Water extraction of plant tissue followed by ether dissociation of the auxin-complex was found to be unsuitable for quantitative studies. It was found that IAA is stable for up to 3 hours at pH values from 1·5 to 9·0; IAA is stable to fluorescent radiation for up to 180 minutes of exposure, but after 60 and 180 minutes of exposure to infra-red radiation IAA was partially decomposed; boiling plant tissue in the presence of IAA for a short time did not destroy IAA. A method for the extraction and quantitative determination of IAA in green plant tissue is outlined, combining the extraction method of Kefford with paper chromatography.

3382. Vlitos, A. J., and Meudt, W.
**The role of auxin in plant flowering. III. Free indole acids in short-day plants grown under photoinductive and nonphotoinductive daylengths.**
*Contr. Boyce Thompson Inst.*, 1954, **17**: 413-17, bibl. 7.

Free indole acids extracted from tissues of short-day plants grown under photoinductive and nonphotoinductive daylengths were examined by means of quantitative paper chromatography. 3-indolepyruvic acid was found in the leaves of Maryland Mammoth tobacco; free IAA was found in greater quantities in plants grown under photoinductive daylengths. The authors suggest that free IAA may not have a direct effect on photoinduction or floral initiation in short-day plants, but its synthesis may be influenced by daylength.

3383. Linser, H.
Über die Wirkung von Indol-3-Essigsäure auf das Längenwachstum von Keimlingen verschiedener *Brassica*-Arten. **(The action of indole-3-acetic acid on the elongation growth of seedlings of several *Brassica* species.)**
*Planta*, 1954, **43**: 440-5, bibl. 5.

Seedlings of *Brassica* species yielding extracts very rich in growth substances responded to indole-3-acetic acid (applied by paste at several concentrations) in a similar manner to seedlings of other plants with a low growth substance content. With whole seedlings indole-3-acetic acid, almost without exception, caused inhibition of growth, while the growth of decapitated *Brassica* plants (which had lost most of their growth substance) was promoted in every case. [Translation of author's summary.]

3384. Galston, A. W., and Dalberg, L. Y.
**The adaptive formation and physiological significance of indoleacetic acid oxidase.**
*Amer. J. Bot.*, 1954, **41**: 373-80, bibl. 24.

Studies were made on the relations of indoleacetic acid and its oxidase in etiolated Alaska pea seedlings. From dissections and analyses it was shown that in meristematic tissues IAA oxidase activity was very low, slower growing tissues had rather higher IAA oxidase levels, and tissues incapable of growth had the highest observed activity. Increased production of this enzyme with increasing age was shown to be due to its adaptive formation in response to high auxin levels.—Calif. Inst. Technol., Pasadena.

3385. Wort, D. J.
**Effect of isonicotinic acid hydrazide on several higher plants.**
*Science*, 1954, **120**: 72-3, bibl. 4, illus.

Experiments were made on the response of dwarf beans, sugar beet, buckwheat and spring oats to several concentrations of isonicotinic acid hydrazide (INAH), applied 21 days after sowing. INAH solutions were applied by spraying the aerial parts, by immersion of whole leaves or of leaves without the upper epidermis, or by soil applications. Concentrations of 0·1% and 0·2% INAH had no visible effect on the plants; solutions of 0·4% and higher caused stunting, irrespective of method of application. Spraying or leaf immersion did not cause death of bean plants; soil applications of 1·6% were lethal to all species. Growth retardation became apparent 4 days after treatment, in drooping stems and curled and wilted leaves; flowering was retarded 3 to 7 days at higher concentrations, but was accomplished by all surviving plants. Photosynthesis and adventitious root production in cut bean stems immersed in 1·2% or 1·6% solutions of INAH were very considerably reduced. Catalase activity was less in treated plants than in the controls; phosphatase activity was not significantly reduced. The effects of INAH are compared with those of maleic hydrazide.

3386. Kick, H.
Pflanzenertrag und Nährstoffaufnahme bei Düngung mit wuchsstoffartigen Stoffen. **(The effect of manuring with growth substances on yields and absorption of nutrients.)**
*Z. PflErnähr. Dung.*, 1953, **63**: 30-7, bibl. 6.

In pot trials with rape and mustard as test plants a yield increase of 15% in the above-ground parts of the plants (harvested before flowering) was obtained by applying phenyl acetic acid and ascorbic acid with the water given. Aneurin and cis-cinnamic acid also raised yields slightly. Soaking the seed in growth substance solutions and treating the plants by spraying failed to give a response. A small increase in the absorption of $P_2O_5$ was noted as a result of growth substance applications.—Landw. Hochschule, Hohenheim.

3387. Lougheed, A. W.
**Present status of maleic hydrazide.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 114-16.

Maleic hydrazide is used for: control of couch grass, improved storage of some vegetables, sucker control in tobacco, peach thinning, improving the keeping quality of cut flowers and as a grass growth regulator. It is reported that when cut roses are dipped in a 0·3% solution of MH-30 they can be kept for up to 2 weeks.

## *Biochemistry.*

(*See also* 3443g, n, o, s, u, v, y, 3444b, g, h, j, l, 3780-3782, 4275, 4356.)

3388. Venkateswarlu, P., and Narayana Rao, D.
**Estimation of fluorine in biological material.**
*Analyt. Chem.*, 1954, **26**: 766-7, bibl. 4.

The new method of fluorine estimation described was tested on a sample of tea.—Med. Coll., Trivandrum, India.

3389. Jones, G. B.
**The polarographic estimation of molybdenum in plant materials.** [French and German summaries.]
*Analyt. chim. Acta*, 1954, **10**: 584-90, bibl. 11.

A method has been developed whereby molybdenum is extracted from digests of plant materials by means of α-benzoinoxime and chloroform from a medium of 1% sulphuric acid solution. Following the decomposition of the extract, the molybdenum is estimated polarographically by measuring the catalytic wave in a sulphuric acid-perchlorate supporting electrolyte in which the sensitivity is increased tenfold over the normal wave. The method provides a selective, highly sensitive procedure, capable of determining very small quantities of molybdenum. [Author's summary.]—Univ. of Adelaide, South Australia.

3390. Nicholas, D. J. D.
**Some aspects of the use of fungi as test organisms for determining Mg and trace metals in soils and plants.**
*Trans. Joint Mtg Commissions II and IV int. Soc. Soil Sci.*, July 1952, pp. 159-63, bibl. 6.

A short description is given here of the bioassay method for determining Mg, Cu, Zn, Mn and Mo in soils by the use of *Aspergillus niger* and *Penicillium glaucum*.

3391. Wood, J. G.
**Nitrogen metabolism of higher plants.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 1-22, bibl. 149.

This review deals with problems of nitrate reduction and of the metabolism of amino acids, amides and proteins, covering literature published before July 1952.

3392. Bottini, E., and Tarantola, C.
Il metabolismo delle sostanze proteiche durante la germogliazione di cariossidi e semi, studiato per mezzo della cromatografia. **(Chromatographic studies of protein metabolism in caryopses and seeds during germination.)** [English summary 9 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 809-35, bibl. 8.

Protein metabolism was studied in the pea, among other plants, and the amino-acids present in the seed and the seedling were determined.—Univ. Turin.

3393. Lisicyn, D. I.
**Seasonal changes of sugars in "glucosidal" plants.** [Russian.]
*Biohimija*, 1954, **19**: 150-5, bibl. 9.

Sucrose and labile glucosides were found in all the organs of lilac (*Syringa vulgaris*) and ash (*Fraxinus excelsior*) examined, but fructosides were, in some cases, low in content or even absent. The study of seasonal variation of sugar ratios in the buds and leaves showed that the greatest change occurred in the sucrose and fructoside contents, which increased markedly in the autumn and winter and fell during the summer. The l-glucoside content showed less variation. The capacity for accumulating sucrose and fructosides in the winter was correlated with hardiness. It was found that when lilac buds, which had comparatively high contents of all sucrose fractions, were kept in the dark, the fructosides were reduced, and thus behaved as typical reserve polysaccharides. Sucrose and l-glucosides increased rather than diminished, especially during the first 48 hours, indicating that these labile compounds are important intermediaries in carbohydrate metabolism.

3394. Price, C. A., and Thimann, K. V.
**The estimation of dehydrogenases in plant tissue.**
*Plant Physiol.*, 1954, **29**: 113-24, bibl. 43.

This paper is concerned with the optimum conditions for the extraction of succinic and malic dehydrogenases as well as for that of succinic, malic and α-ketoglutaric oxidases, and with the quantitative assay of these enzymes in plant tissue.

3395. Noll, C. R., Jr., and Burris, R. H.
**Nature and distribution of glycolic acid oxidase in plants.**
*Plant Physiol.*, 1954, **29**: 261-5, bibl. 20.

Leaves of broccoli, cabbage, kohl rabi, asparagus, spinach beet, squash, lima bean, carrot, rhubarb, raspberry, *Lilium tigrinum*, *Iris germanica*, zinnia, grape, dogwood (*Cornus stolonifera*), lilac, and hackberry (*Celtis occidentalis*) were tested for and yielded glycolic acid oxidase. In general, activity of the enzyme was higher with glycolic acid as a substrate than with lactic acid.

3396. Sugawara, T.
**Studies on the formation of ascorbic acid (vitamin C) in plants. 5. The germination of seeds and the production of ascorbic acid.**
*Jap. J. Bot.*, 1953, **14**: 125-46, from English abstr. in *Rec. Res., Fac. Agric. Univ. Tokyo 1952-1953*, 1954, No. III, pp. 1-2.

Seeds of 20 plant species were used, and were germinated in a dark thermostat at 25° to 30° C. Results showed that light did not affect the formation of ascorbic acid at the early germination stages when nutritive substances were plentiful; with subsequent exhaustion of the stores, however, the ascorbic acid content was affected by light. The amount of ascorbic acid present in germinating seeds after 120 hours illumination was about 65% greater than in those germinating in the dark, but the amount present in seeds in the dark was increased when manganese and boron were also supplied. Although the rate of ascorbic acid formation fell in seeds germinating in the dark, the growth rate was not affected.

3397. Chichester, C. O., Wong, P. S., and MacKinney, G.
**On the biosynthesis of carotenoids.**
*Plant Physiol.*, 1954, **29**: 238-41, bibl. 10.

Analyses of yellow and "apricot" varieties of *Viola tricolor* indicated that xanthophyll components were the main constituents of the former, and that lycopene predominated in the latter variety. An experiment using labelled sugar with *Phycomyces* showed that the carotenoid C was preferably drawn from non-sugar sources.

### *Radioactive isotopes.*

(*See also* 3443a, 3976, 4003e.)

3398. Graham, B. F., Jr.
**A technique for introducing radioactive isotopes into tree stems.**
*Ecology*, 1954, **35**: 415, illus.

Advantages claimed are: laboratory convenience, uniform volume facilitated, concentration of isotope in the region of the phloem, cambium and sapwood, suberization kept to a minimum.—Duke Univ., Durham, N.C.

3399. Toth, S. J., and Romney, E. M.
**Comparison of methods of preparing thin-tissue plant leaves for autoradiography.**
*Soil Sci.*, 1954, **78**: 95-8, bibl. 2.

A study was made of the dry-press, dry-ice, freeze-dry and propylene glycol methods of dehydrating plant tissue containing $Co^{60}$ and $Mn^{54}$ for preparing autoradiographs. There was little difference in the distribution pattern of these two substances in soya bean leaves as shown by autoradiographs prepared by the different methods. The dry-press method seems to be the most practical of those tried.

### *Nutrition.*

(*See also* 3444i, 3777-3779, 3926-3929, 3972-3975, 4074, 4105, 4194, 4274, 4455.)

3400. Iljin, W. S.
Nutrición mineral de las plantas. Estudio crítico. **(The mineral nutrition of plants. A critical review.)**
*Rev. Fac. Ing. agron. Maracay*, 1954, **1**: 223-305, bibl. 391.

Subjects covered are the soil as a source of the mineral nutrition of plants, soil fertility and the biochemical analyses of plants, phosphorus, potassium, magnesium, calcium and micro-elements.

3401. Hewitt, E. J.
**The use of sand cultures for the study of mineral disorders, especially micronutrient deficiencies.**
*Trans. Joint Mtg Commissions II and IV int. Soc. Soil Sci.*, July 1952, pp. 240-2, bibl. 2.

A note on choice of technique is followed by brief descriptions of containers, sand, water, reagents and seed.

3402. BINGHAM, F. T., CHAPMAN, H. D., AND PUGH, A. L.
**Solution-culture studies of nitrite toxicity to plants.**
*Proc. Soil Sci. Soc. Amer.*, 1954, **18**: 305-8, bibl. 5.

Solution-culture studies on the toxicity of nitrites to plants were made using as indicators Atlas barley, blackeye beans and Marglobe tomatoes. The plants were grown for 3 to 4 weeks in complete nutrient solutions containing graded amounts of nitrous acid (varying nitrite and pH levels). Results showed that growth inhibition in the pH 4·0, 5·0, and 6·0 solutions was related to the undissociated nitrous acid fraction. There was an indication that, with tomato plants, a given concentration of nitrous acid was less injurious to the plant when the N available for uptake was supplied as nitrate rather than as ammonium salts.

3403. CHILEAN NITRATE EDUCATIONAL BUREAU, INC.
***Bibliography of the literature on the minor elements and their relation to plant and animal nutrition.*** 4th edition, Vol. III. Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York, 1953, pp. 117.

This volume includes material published from January 1951 to December 1952, and contains 1,000 abstracts covering 45 elements. The abstracts are obtained mainly from *Chemical Abstracts* and *Soils and Fertilizers*. Indices are also provided, grouped under author, element, animal nutrition and botanical headings.

3404. DE KOCK, P. C., AND STRMECKI, E. L.
**An investigation into the growth promoting effects of a lignite.**
*Physiol. Plant.*, 1954, **7**: 503-12, bibl. 31.

It is shown that mustard grown in water culture responds markedly to small additions of lignite. Stimulation was considered to be due to the complexing action of the humic acid on the iron in solution rather than to any trace elements contained in the lignite. The ability to form a metallo-organic complex, probably rendering the iron in the nutrient medium more available, appears to determine the growth promoting response. From the results it would appear that the relative amounts of iron and phosphorus absorbed by the plant determine whether the plant will show chlorotic symptoms or appear healthy. [From authors' summary.]—Macaulay Inst. Soil Res.

3405. WARINGTON, K.
**Recent work on molybdenum and some micro-nutrient interactions.**
*A.R. Rothamsted exp. Stat. 1953*, 1954, pp. 181-7, bibl. 46.

This is a brief review of the role and importance of molybdenum in plant physiology. Deficiency symptoms and effects of excesses are described. Interactions between molybdenum and other minor elements, and the effects of these elements on the iron metabolism of plants are discussed.

3406. GIOVANNINI, E.
Il molibdeno "elemento oligodinamico". **(Molybdenum, an "oligodynamic" element.)** [English summary 7 lines.]
*Ann. Sper. agrar.*, 1954, Vol. **8**, *Suppl.* pp. xix-xxxvi, bibl. 59.

Molybdenum in plants and in the soil, toxicity, colorimetric and spectrographic methods of determination in plants and in the soil.

3407. REDISKE, J. H., AND SELDERS, A. A.
**The uptake and translocation of yttrium by higher plants.**
*Amer. J. Bot.*, 1954, **41**: 238-42, bibl. 8.

Red kidney bush beans and Rutgers tomatoes were grown in nutrient solutions to study the uptake of yttrium, $Y^{91}$ being used as a tracer. In general the uptake was proportional to the amount of yttrium added to the solution, but the uptake efficiency tended to increase at added concentrations above 1 p.p.m. Between pH 4 and 6, the uptake efficiency was proportional to the hydrogen ion concentration. Tomato showed the greater uptake efficiency for yttrium with a leaf: root ratio of $2 \times 10^{-3}$, while with bean the leaf: root ratio was $6 \times 10^{-4}$. There was little re-translocation from the aerial tissues and little loss occurred from the massive accumulations on the roots.—Univ. Calif., Davis.

3408. WEINSTEIN, L. H., ROBBINS, W. R., AND PERKINS, H. F.
**Chelating agents and plant nutrition.**
*Science*, 1954, **120**: 41-3, bibl. 25, illus.

Present knowledge particularly with regard to the use of EDTA is reviewed. It is noted that on neutral or alkaline soils it meets with little success and that new chelating agents such as diethylenetriaminepentaacetic acid (DTPA), N-hydroxyethylenediaminetriacetic acid (HEEDTA) and N,N′-dihydroxyethylenediaminediacetic acid (HEEDDA) are now being tested.

3409. DEUEL, H.
Über Störungen des Spurenelementhaushaltes der Pflanzen durch Welketoxine. **(On disturbances of the minor element balance in plants due to wilting toxins.)**
*Phytopath. Z.*, 1954, **21**: 337-48, bibl. pp. 3.

A review of the literature leads the author to the conclusion that the toxic action of wilting toxins, such as lycomarasmin and fusaric acid produced by *Fusarium lycopersici*, is due to their capacity for forming metal chelates.

3410. GÄUMANN, E., AND NAEF-ROTH, S.
Über die chelierende Wirkung einiger Welketoxine I. **(On the chelating action of some wilting toxins. I.)**
*Phytopath. Z.*, 1954, **21**: 349-66, bibl. 8, illus.

The chelating agent Komplexon III (the disodium salt of ethylenediaminetetraacetic acid) was shown to cause injuries to young tomato shoots similar to those produced by lycomarasmin and fusaric acid. The injurious effect of these wilting toxins is therefore assumed to be due to their capacity to fix metal ions essential for the metabolism of enzymes. Experiments in which Komplexon III was applied to tomato shoots in combination with tomato ash are discussed in detail. —Eidg. tech. Hochschule, Zürich.

3411. Boynton, D.
**Nutrition by foliar application.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 31-54, bibl. 82.

This review covers a selection of papers which permit a critical evaluation of the current status of knowledge on this subject. The literature is considered under 3 main headings, plant responses to sprays of specific nutrients, factors affecting absorption and the use of nutrients sprayed on leaves, and conditions determining the feasibility of nutrition by foliar application. The author concludes that, although it seems unlikely that foliar application of nutrients will supplant soil application as a general practice, it is a satisfactory means of dealing with a number of special problems.

3412. Kaindl, K.
Untersuchung über die Aufnahme von $P^{32}$ markiertem primärem Kaliumphosphat durch die Blattoberfläche. (**The absorption of $P^{32}$-labelled potassium phosphate by the leaf surface.**)
*Bodenkultur*, 1953, **7**: 324-53, bibl. 18.

The leaves of several test plants (wheat and two dicotyledonous weeds) were treated with $P^{32}$-labelled $KH_2PO_4$. The seedling stage, about a fortnight after sowing, and especially the later stage when growth was most active, were shown to be the optimum times for foliar P applications, an evening of high air humidity being best suited to the treatment. As with soil applications, a response can only be expected on P-deficient soils. Where possible, as for instance in the case of fruit trees, the spray should be directed onto the lower surface of the leaves. Reasons are given for the greater economy of foliar than of soil applications.

3413. Scharrer, K., and Bürke, R.
Der Einfluss der Ernährung auf die Provitamin-A-(Carotin)-Bildung in landwirtschaftlichen Nutzpflanzen. (**The effect of nutrition on pro-vitamin A (carotene) formation in cultivated plants.**)
*Z. PflErnähr. Düng.*, 1953, **62**: 244-62, bibl. 11.

From manurial trials with several crops, including lettuce, spinach and carrots for which data are tabulated, the following general conclusions are drawn: (1) Nitrogen has a pronouncedly favourable effect on carotene formation; N applications in excess of the optimum for high yields may still increase the carotene content. (2) Phosphates are indispensable for the attainment of maximum carotene values, the optimum P dosage coinciding with that for maximum yields. (3) The effect of potassium depends on N supplies; excessive K applications tend to depress the carotene content. (4) Magnesium promotes carotene formation. (5) Calcium and sodium applied with a balanced fertilizer may improve the carotene content, but excessive Ca and Na applications are detrimental. (6) Nitrates and potassium sulphate appear to have a more favourable effect on the biosynthesis of carotene than ammonium salts and potassium chloride respectively.—Univ. Giessen.

3414. Ryle, M.
**The influence of nitrogen, phosphate and potash on the secretion of nectar. Part I.**
*J. agric. Sci.*, 1954, **44**: 400-7, bibl. 19.

Experiments were carried out to test the effects of N, P and K on nectar secretion by apple, mustard and buckwheat. In the case of apple (Cox's Orange Pippin on Malling XII) the mean quantity of sugar per flower was significantly increased by extra potash, and phosphate also tended to increase it. At the higher level of potash, N significantly increased the crop in 1951, but decreased the nectar yield in 1952. Potash increased nectar yield most when its effect on the crop had been small, and *vice versa*.—Rothamsted exp. Stat.

## *Soil management and irrigation.*

(*See also* 3513, 3774-3776.)

3415. Quastel, J. H.
**Soil conditioners.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 75-92, bibl. 74.

This review takes the form of a general discussion on the value, uses and properties of synthetic soil conditioners. Some attention is paid to the historical aspect. References relate to results published before September 1953.

3416. Webster, G. R., and others.
**Mulches for horticultural crops.**
*Mimeo. Saanichton exp. Stat., B.C.*, **147**, 1954, pp. 12, illus.

This paper is the fourth in a series of reports on mulches for horticultural crops on Vancouver Island. [For earlier reports see *H.A.*, 22: 60, 23: 89 and 24: 55.] Summaries are given of the results obtained to date with boysenberries, loganberries, strawberries, pears, cherries, peaches, bulbs, vegetables, roses and newly seeded lawns. The mulch materials tested were hay and sawdust.

3417. Wade, P.
**Soil fumigation. II.—The stability of ethylene dibromide in soil.**
*J. Sci. Food Agric.*, 1954, **5**: 288-91, bibl. 6.

Liquid ethylene dibromide introduced into soils has been shown to be stable at moisture contents in the field range for periods of up to 1 week. Attempts to induce soils to decompose ethylene dibromide by repeated fumigation of soil samples were unsuccessful. [From author's summary.]

3418. Anon.
**Nematodes—crop nemesis.**
*Agric. Res.*, 1954, **3** (1): 8-9, illus.

This article includes a brief mention of a soil fumigation technique against nematodes. The liquid chemical (D-D or ethylene dibromide) is used in a dry absorbent silica or vermiculite carrier, so that fields may be treated by fertilizing machines. The carrier helps to spread the fumigant evenly and adds to its persistence in the soil.

3419. Schaffnit, E., and Neumann, P.
Über den Einfluss biotischer und abiotischer Umweltfaktoren auf die Infektion der Pflanze durch Bodenparasiten. **(On the effect of biotic and abiotic environmental factors on the infection of plants by soil parasites.)**
*Z. PflKrankh.*, 1953, **60**: 577-93, bibl. 77, illus.
Über den Einfluss des Bodens, insbesondere von Torf- und Moorboden, auf die Infektion von Keimlingen landwirtschaftlicher und gärtnerischer Kulturpflanzen durch parasitäre Bodenpilze. **(On the influence of the soil, especially peat and bog soil, on the infection of seedlings of agricultural and horticultural plants by parasitic soil fungi.)**
*Z. PflBau*, 1953, **4**: 241-51, bibl. 18.

These papers are the 11th and 12th communications in the series *Beiträge zur Kenntnis der Wechselbeziehungen zwischen Kulturpflanzen, ihren Parasiten und der Umwelt* (Contributions to the study of interrelations between cultivated plants, their parasites and environment), edited by E. Schaffnit. The complicated interrelations between soil mixture (peat and sand, sterilized and not sterilized, etc.), virulence of the soil parasite (*Rhizoctonia* [=*Corticium*] *solani* and others) and their antagonists are discussed with reference to some cultivated plants, including cauliflower, cabbage and cucumber. A generous admixture of peat (about 20%) to the seedbed soil, neutralized by lime, was found to reduce damping-off in vegetables caused by *Corticium solani*.

3420. Ministry of Agriculture, London.
**Irrigation.**
*Bull. Minist. Agric. Lond.* **138,** 2nd edition, 1954, pp. 46, illus., 3s.

Since 1947, when the Ministry's bulletin was first published, much field experience and experimental work together with the development of a method of estimating soil moisture usage by a crop have made it possible to give more precise recommendations for irrigation management. In this second edition of the bulletin the recent advances made in irrigation practice are noted, and an outline of pumping plant and irrigation systems and of their application in practice is included. Read in conjunction with the *Technical Bulletin* No. 4, "The calculation of irrigation need", this bulletin provides the grower with the most recent information on irrigation management. J.E.G.

3421. Ministry of Agriculture, London.
**The calculation of irrigation need.**
*Tech. Bull. Minist. Agric. Lond.* **4,** 1954, pp. 37, illus., bibl. 11, 2s.

This bulletin has been published to supplement the Ministry's Bulletin No. 138 [see preceding abstract]. It states in a complete and reasonably concise form the problems of controlled irrigation, and the solutions available to meet these problems based on the calculation of potential transpiration from weather data, and it will serve as an invaluable handbook for all concerned in the irrigation of field crops. A section is included dealing with the problem of water need under glass, but at the present time it appears that direct measurement of soil moisture remains the most precise method of assessing the irrigation need of glasshouse crops. The practical use of the methods of calculating irrigation need is well explained, and examples are given making it relatively easy for anyone to use the information provided without the necessity for complicated formulae and with only a gauge to measure rainfall. The bulletin will be particularly useful for those who have had doubts regarding the need for irrigation in their own localities. Maps have been prepared showing the probable irrigation need throughout England and Wales. J.E.G.

3422. Webster, G. R., and others.
**A report on irrigation experiments.**
*Mimeo. Saanichton exp. Stat. B.C.*, **148,** 1954, pp. 11, illus.

This paper is the fourth in a series of reports on sprinkler irrigation experiments on Vancouver Island. [For earlier reports see *H.A.*, 22: 1173, 23: 100 and 24: 62.] Results obtained during the period 1949–53 are tabulated and discussed. The crops include small fruits, apples, brassicas and bulbs.

### *Climate and weather.*

(*See also* 3444m, n, 3490.)

3423. Davies, D. A.
**Experiments on artificial stimulation of rain in East Africa.**
*Nature*, 1954, **174**: 256-8, bibl. 7.

Further experiments on cloud seeding [see *H.A.*, 21: 3227 and 22: 3264] were carried out at Amboseli, southern Kenya, from 18 October to 12 December, 1953, and at Dodoma, Tanganyika, from 3 January to 31 March, 1954. The seeding agent was again finely ground hygroscopic salt which was conveyed to the clouds in hydrogen balloons. From the figures quoted for the frequency of rainfall following the seeding it is concluded "that the cloud seeding did stimulate rainfall on the majority of occasions, but that such rainfall was generally very light or light". The theoretical interpretation of the observations recorded is briefly discussed. In the next series of experiments to be conducted in 1954 it is proposed to reduce the particle size of the hygroscopic substance, which should result in more rain being produced, though after a longer interval.—East African meteor. Dep.

3424. Moffett, J. O., and Parker, R. L.
**Relation of weather factors to nectarflow in honey production.**
*Tech. Bull. Kans. agric. Exp. Stat.* **74,** 1953, pp. 27, bibl. 26, illus.

The effect of weather factors on nectar flow has been studied in Kansas since 1918, by recording daily gains and losses in the weight of bee colonies. Results showed that 60% of the honey crop was stored between 16 June and 15 July; high June rainfall was associated with an increase in nectar flow; a warm April, and a cool May and June were favourable for a good honey crop; a relatively high number (26·6) of cloudy days during the period May–August gave a better nectar flow than a lower number; most nectar was collected on days when the maximum temperature was between 90° and 94° F. and extremely high or extremely low temperatures were not favourable to a good daily nectar flow.

### *Glasshouses.*

(*See also* 3443m, t, 3918, 4480.)

3425. Hoare, E. R.
**Designing a mobile glasshouse.**
*Grower*, 1954, **42**: 30-1, illus.

A mobile glasshouse designed by the National Institute of Agricultural Engineering is described. The house is 115 × 115 ft. and consists of Dutch lights, hinged at the ends to allow passage over a crop 5 ft. 6 in. high. There are rails attached to the structure and these run along wheels permanently fixed to blocks in the ground. The present cost is about £3,500.

3426. Smirnov, N. A.
**Fertilization of vegetables with carbon dioxide in glasshouses and frames.** [Russian.]
*Priroda*, 1954, **43** (7): 100-2, illus.

Treatments with carbon dioxide increase not only the yield but also the quality of some vegetables. The majority of crops respond favourably to 0·2–0·3% $CO_2$ in the atmosphere, but for optimum production cucumbers should be grown in an atmosphere containing 0·5–0·6% $CO_2$, radishes 0·35–0·5% and tomatoes and beans about 0·3%. Carbon dioxide is applied in the form of gas, liquid, solid (dry ice) or can be produced by burning charcoal or some other fuel. A simple method of producing $CO_2$ by means of a bee smoker is described. By this method carbon monoxide can also be produced which, it is stated, results in an earlier development of female flowers in some cucumber varieties.

3427. Moser, W.
Der Hagelschutz im Gartenbau. (**Protection against hail injury.**)
*Schweiz. Gärtnerztg*, 1954, **57** (22): 2-3, illus.

In Switzerland wire netting (1–1·5 cm. mesh) and hardened glass (Gotthardglass) are widely used for the protection of lights and glasshouse roofs.

3428. Wells, J. S.
**Ideal propagating house.**
*Amer. Nurserym.*, 1954, **99** (11): 12-13, 47-51, illus.

In response to queries the author states what he considers to be essential for an ideal propagating house: access on all sides for vehicles, dependable power and water supplies, automatic heat control and a humidification system. Practical details and plans for the construction of a sash house, considered to be the most suitable propagating unit, are given.

3429. Bel.
Gewächshäuser aus Sarangewebe. (**Greenhouses of saran material.**)
*Schweiz. Gärtnerztg*, 1954, **57** (24): 6, illus.

In Switzerland experiments—mainly by official bodies—are in progress to explore the horticultural uses of saran tissue made of the synthetic saran fibre. The material appears to be promising for shading as well as for the protection of plants against frost, hail and pelting rain.

3430. Lawrence, W. J. C., and Calvert, A.
**The artificial illumination of seedlings.**
*J. hort. Sci.*, 1954, **29**: 157-74, bibl. 16, illus.

Tomato, lettuce and cucumber seedlings were grown under normal glasshouse conditions with supplementary illumination in winter. With 5 types of discharge lamp, increase in plant weight was significantly correlated with increase in foot-candles. Neon and mercury lamps gave a superior plant response per unit illuminated area to that of sodium and fluorescent lamps; mercury-tungsten lamps induced "drawn" growth and were not satisfactory. The regressions of light intensity on increase in plant weight of tomato and lettuce seedlings irradiated by neon, mercury and sodium lamps showed a substantial difference between neon and mercury lamps, but not between mercury and sodium. No substantial differences were found when the intensity values were corrected by factors based on Hoover's carbon assimilation curve for wheat. The adequate mean intensity for practical illumination is 300 to 500 foot-candles as measured by a selenium photo-cell. From an economic point of view the 400 w. High Pressure Mercury Vapour lamp was considered to be the most suitable light source for seedling illumination. Some illuminated tomato seedlings, grown on to fruiting, showed a yield increase in the first 3 weeks of cropping of 8 to 12 oz. per plant, and a total increase of 16 to 21 oz. per plant. Tomato plants showed chlorosis and distortion of leaves unless they had an unbroken period of 6 hours darkness each day.—John Innes Hort. Instn, Bayfordbury.

3431. Czaja, A. T.
Wurzelschäden bei Topfpflanzen. (**Root injuries to pot plants.**) [English summary 13 lines.]
*Z. PflKrankh.*, 1954, **61**: 247-55, bibl. 3, illus.

Injuries to the roots of pot plants in several German nurseries were found to be due to alkaline cauterization resulting from the high pH of the material from which the pots were made. The experiments were carried out with garden cress, hyacinth and other ornamental plants.—Tech. Hochschule, Aachen.

3432. Ankinovič, G. B., and Ljubimov, A. A.
**Bees in glasshouses and frames.** [Russian.]
*Sad i Ogorod*, 1954, No. 5, pp. 24-7, illus.

The use of bees for pollinating glasshouse crops, mainly cucumbers, was started in the Soviet Union in 1930–1931. Only healthy, strong colonies are suitable for indoor pollination, and even then the exchange of hives was found advantageous. Recommendations are made on the size and placement of hives in various houses and on the care of the bees indoors. For the pollination of cucumbers in frames the strength and activity of the colonies is of even greater importance than in the houses. A method of directed cross-pollination by bees is also mentioned. The desired pollen is scattered in a small tube which is then placed in a hive of young bees. By moving through the tube the bees get covered with the pollen before visiting the flowers to be pollinated.

### *Sundry appliances and materials.*

(*See also* 3686, 4056, 4244, 4254, 4334.)

3433. Smith, G. L., and Little, D. E.
**Variable leaf punch.**
*Calif. Agric.*, 1954, **8** (6): 13, illus.

A foliage sampling tool for use in studies with unit leaf sections.

3434. Nagel, J. F.
**New recording rain-guages.**
*J. sci. Instrum.*, 1954, **31**: 158-62, bibl. 10.

Two automatic rain-gauges, in which the syphoning principle is applied, are described with diagrams; one is intended for daily recording and the other is designed to record continuously for 200 days.—Weather Bureau, Pretoria, South Africa.

3435. Trupin, F.
Une planteuse pour pepinières. (**A planting machine for nurseries.**)
*Fruits d'Outre Mer*, 1954, **9**: 203-6, illus.

A description illustrated with photographs and diagrams is given of a small shrub-planting machine for use in the nursery. It is a converted cabbage planter and can be fitted with up to 8 planting units. With 2 units in action it can plant 10,000 plants in a day.

3436. Victor, —., and Horst, —.
In Geisenheim wurden Maschinen vorgeführt. (**A demonstration of horticultural machinery at Geisenheim.**)
*Tech. Bauern Gärtn., Ausg. A*, 1954, **6**: 302-4, illus.

The implements described and illustrated include new models of machines for the preparation of compost, for cultivating the soil in orchard and vineyard—among them a small plough driven by an electric motor—and for grubbing trees.

3437. Seifert, F.
In 40 Sekunden ein Baumloch (**A planting hole for trees dug in 40 seconds.**)
*Tech. Bauern Gärtn., Ausg. A*, 1954, **6**: 183, illus.

The simple tractor-driven shovel described and illustrated digs planting holes for fruit trees.

3438. Street, A. T.
**Seed cleaning and its machinery.**
*J. Inst. Corn agric. Merch.*, 1954, **4**: 95-101, illus.

Illustrations, diagrams and text show clearly the whole process of seed cleaning, mainly with reference to cereals, grasses and clovers. It is noted that a special model is manufactured for use with pulses and that a separator is required to grade the seed and to separate large and small impurities by width and aspiration in pulse, bean and pea seed.

3439. Weick, F. E.
**Aircraft spraying and dusting.**
*J. agric. Food Chem.*, 1954, **2**: 546-9, illus.

The development of agricultural aeroplanes for dusting, spraying, seeding and fertilizing.

3440. White, W. E.
**Comparative durability of posts from trees grown in Pennsylvania woodlands.**
*Progr. Rep. Pa agric. Exp. Stat.* **123,** 1954, pp. 6, illus.

Posts were made from 19 species of hard- and soft-wood trees and treated with preservatives including creosote, zinc chloride, chromated zinc chloride, pentachlorphenol, copper naphthenate, Osmose salts and copper sulphate. Most of the treated posts set in 1939 and 1941 were still serviceable in 1953, though there were some exceptions, notably red and scarlet oak treated with chromated zinc chloride applied by the tyre-tube method and in augur holes. Meantime most of the untreated posts of the less durable species had failed. Some pine posts failed completely in 1 to 4 years.

3441. Sarles, R. L.
**Fence posts.**
*Ohio Fm Home Res.*, Jan.-Feb. 1954, pp. 9, 14.

In tests with non-durable woods creosote oil and a copper naphthenate solution containing 0·5% copper in fuel oil were used as preservatives. When application was made by the 15-second dip method the preservative result was negligible, but when the hot-cold and pressure methods were used considerable success was achieved with both substances, creosote being best when applied by the hot-cold method and copper naphthenate when the pressure method was used.

3442. Hicock, H. W., and Olson, A. R.
**The toxicity to plants of wood preservatives and their solvents.**
*Circ. Conn. agric. Exp. Stat.* **189,** 1954, pp. 4.

The tests were confined to pentachlorophenol and copper naphthenate. Other materials were rejected as unsuitable on various grounds. The authors conclude as the result of the experiments here discussed that pentachlorophenol should never be used in close proximity to growing plants in greenhouses or cold frames, that of the numerous materials tested as solvents for pentachlorophenol or copper naphthenate none can be used near plants with entire safety, and thirdly, that while copper naphthenate itself is apparently not injurious to plants, there is no ready means known at present for introducing it into wood except in solvents which are toxic.

### *Noted.*

3443.

a Atomic Energy Research Establishment.
***Radioactive materials and stable isotopes Catalogue No. 3.*** Isotope Division, Harwell, Berks., England, 1954, pp. 155.

b Bentley, J. A., and Housley, S.
**Bio-assay of plant growth hormones.**
*Physiol. Plant.*, 1954, **7**: 405-19, bibl. 23.
Two methods of aerating coleoptile sections compared.

c Blinks, L. R.
**The photosynthetic function of pigments other than chlorophyll.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 93-114, bibl. 85.

d Burris, R. H.
**Organic acids in plant metabolism.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 91-114, bibl. 147.
Developments between October 1951 and October 1952.

e COCHRAN, W. G.
**The combination of estimates from different experiments.**
*Biometrics*, 1954, **10**: 101-29, bibl. 13.

f FURNEAUX, B. S.
**The soils of East Malling Research Station.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 60-85, bibl. 2, maps 2.
A detailed geological and soil survey.

g GJEMS, O., AND LYDERSEN, D.
Entfernung von Aluminium bei der flammenphotometrischen Bestimmung von Calcium. (**The removal of aluminium in the flame-photometrical determination of calcium.**)
*Z. PflErnähr. Düng.*, 1954, **64**: 36-41, bibl. 10.

h GOODE, J. E.
**Note on the effect of a synthetic soil conditioner, CRD 189, on the water relationships of a fine sandy loam.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 123-9, bibl. 5, illus.
Preparatory to planting strawberries.

i GOODWIN, R. H.
**Fluorescent substances in plants.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 283-304, bibl. 217.

j GREGORY, F. G., SPEAR, I., AND THIMANN, K. V.
**The interrelation between $CO_2$ metabolism and photoperiodism in *Kalanchoë*.**
*Plant Physiol.*, 1954, **29**: 220-9, bibl. 20, illus.

k HAUDE, W.
Zur praktischen Bestimmung der aktuellen und potentiellen Evaporation und Evapotranspiration. (**The measurement of actual and potential evaporation and evapotranspiration.**)
*Mitt. dtsch. Wetterdienst.*, 1954, No. 8, pp. 22, bibl. 12.

l HILL, R., AND HARTREE, E. F.
**Hematin compounds in plants.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 115-50, bibl. 216.
And their relation to plant respiration.

m HOARE, E. R.
**"Degree-days" to calculate fuel demands.**
*Grower*, 1954, **42**: 127-31.
In glasshouses.

m ISHERWOOD, F. A., AND CRUICKSHANK, D. H.
**A new method for the colorimetric estimation of amino-acids on paper chromatograms.**
*Nature*, 1954, **174**: 123-6, bibl. 9.

o JAGENDORF, A. T., AND WILDMAN, S. G.
**The proteins of green leaves. VI. Centrifugal fractionation of tobacco leaf homogenates and some properties of isolated chloroplasts.**
*Plant Physiol.*, 1954, **29**: 270-9, bibl. 37.

p JAGGI, E.
Preise landwirtschaftlicher Erzeugnisse und Ernteerträge in der Schweiz. (**Agricultural prices and yields in Switzerland in 1953.**) [German and French.]
*Landw. Jb. Schweiz*, 1954, **3**: 75-94.
Including those of fruit and vegetables.

q JAMES, W. O.
**The use of respiratory inhibitors.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 59-90, bibl. 247.

r JAMES, W. O.
**Reaction paths in plant respiration.**
*Endeavour*, 1954, **13**: 155-62, bibl. 19.
A review.

s JONES, G. B.
**The polarographic determination of zinc and manganese in plant and animal tissues and soils.**
*Analyt. chim. Acta*, 1954, **11**: 88-97, bibl. 26.

t KIND, W.
Luftheizung im Gartenbau. (**The hot air system of heating glasshouses.**)
*Gartenwelt*, 1954, **54**: 214-16, illus.

u LEVITT, L. S.
**The role of magnesium in photosynthesis.**
*Science*, 1954, **120**: 33-5, bibl. 10.
Evidence on the fundamental role of the Mg atom.

v LEVY, A. L.
**A paper chromatographic method for the quantitative estimation of amino-acids.**
*Nature*, 1954, **174**: 126-7, bibl. 9.

w LINSER, H.
Chemische Konstitution und Zellstreckungswirkung verschiedener Stoffe (Versuch einer allgemeinen Wirkstoffhypothese). (**Chemical constitution and the effect on cell elongation of various substances. (A hypothesis on the action of growth-regulating substances.)**)
*Mh. Chem.*, 1954, **85**: 196, from abstract in *Mitt. Klosterneuburg, Ser. B*, 1954, **4**: 136-7.

x MCELROY, W. D., AND NASON, A.
**Mechanism of action of micronutrient elements in enzyme systems.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 1-30, bibl. 174.

y MAPSON, L. W.
**Function of ascorbic acid in plants.**
Reprinted from *Vitamins and Hormones*, 1953, Vol. XI [N.Y.] reprinted as *Food Invest. Mem. D.S.I.R.*, Lond., **854**, pp. 28, bibl. 144.
A review.

z MELIN, E.
**Physiology of mycorrhizal relations in plants.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 325-46, bibl. 145.
A review of relationships in some orchids and forest trees.

3444.

a MINISTRY OF AGRICULTURE, LONDON.
**Slugs and snails.**
*Adv. Leafl. Minist. Agric. Lond.* **115,** amended 1954, pp. 7, illus.

b MITCHELL, T. A.
**The spectrophotometric determination of magnesium with thiazol yellow dyes.**
*Analyst*, 1954, **79**: 280-5, bibl. 21.

c MUNSCHE, D.
Über polarographische Nitratbestimmung im pflanzenphysiologischen Versuch. **(The polarographic determination of nitrate in plant physiological experiments.)**
*Z. PflErnähr. Düng.*, 1953, **62** : 229-39, bibl. 7.

d PRALORAN, J.-C.
La recherche horticole au Maroc. **(Horticultural research in Morocco.)**
*Rev. hort. Paris*, 1954, **126**: 1090-1.

e RAMCKE, C.
Einiges über die Baumschulverhältnisse in Brasilien [Staat Sao Paulo]. **(Observations on nurseries in Brazil (State of São Paulo).)**
*Dtsch. Baumsch.*, 1954, **6**: 149-56, illus.

f RAUTERBERG, E.
Die Berechnung der Streuung von Versuchsergebnissen. **(The calculation of the standard deviation in the analysis of experimental results.)**
*Z. PflErnähr. Düng.*, 1954, **64**: 244-58, bibl. 6.

g SCHECK, H.
Über den Einfluss des Kaliums auf den Kohlehydratstoffwechsel und auf die Carbohydrasen bei Kulturpflanzen. **(The effect of potassium on the metabolism of carbohydrates and on the carbohydrases of cultivated plants.)**
*Z. PflErnähr. Düng.*, 1953, **60**: 209-20, bibl. 21.
Including beets and peas.

h SCHNEIDER, R.
Flammenphotometrische Kalzium-Bestimmung in Pflanzenaschen. **(The estimation of calcium in plant ash by flame photometry.)**
*Landw. Forschung*, 1954, **6**: 200-1.

i SIVARAMAKRISHNAN, V. M., AND SARMA, P. S.
**The influence of vitamins on nitrogen metabolism: Part II. The influence of neopyrithiamine, $\gamma$-(3,4-ureylenecyclohexyl) butyric acid and aminopterin on amino acid changes during germination.**
*J. sci. industr. Res., India*, 1954, **13B**: 413-18, bibl. 23.
Using green gram (*Phaseolus aureus*).

j VANSTONE, F. H.
**A quantitative flame spectrographic method for plant material.**
Reprinted from *Trans. int. Congr. Soil Sci.*, Dublin, 1952, pp. 292-3, bibl. 2.
See also *H.A.*, 22: 2053.

k VIRGIN, H. I.
**Physical properties of protoplasm.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 363-82, bibl. 93.

l WALLACE, T.
**Plant diagnostic methods.**
Reprinted from *Trans. int. Congr. Soil Sci.*, Dublin, 1952, pp. 231-9, bibl. 15.

m WENT, F. W.
**The effect of temperature on plant growth.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 347-62, bibl. 157.

n WENT, F. W.
Klimaets indvirkning på planter. **(The effect of climate on plants.)**
*Nat. Verd. Kbh.*, 1954, **38**: 55-70, bibl. 1, illus.
Deals with work at the Earhart Plant Research Laboratory.

# TREE FRUITS, DECIDUOUS.

## *General.*

(*See also* 3324, 3325, 3330, 3337, 3340, 3341, 3437, 3443p, 3539e, g, i, m, o, u, v, 4451, 4452, 4466, 4469, 4472, 4474, 4482, 4488.)

3445. C.S.I.R.O., AUSTRALIA.
**Fruit investigations.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 21-2.

At Hobart studies on the relationship of storage disorders to apple fruit physiology were continued: an increase in protein N content was detected at the time of the onset of breakdown. Studies on the effect of manurial treatment on keeping quality showed that nutrient sprays applied at the time of fruit cell division had no effect, whereas fruit sprayed during the period of cell enlargement gave a satisfactory quantitative response. There was a strong intercorrelation between percentage disorder, mean fruit size, cell volume and respiration per unit protein. Respiration per cell, protein N per cell, cell volume and respiration per unit protein were intercorrelated. There was no significant modifying effect of P and K on the action of nitrogen. Data showed an interaction between Jonathan spot and breakdown, each tending to suppress the other. There were indications of a relationship between fruit physiology and fungal development. Preliminary gas storage trials with Golden Delicious, Delicious, Granny Smith and Sturmer at 5% oxygen, and no carbon dioxide, at 32, 35, and 36° F. showed promise: scald and breakdown were reduced and texture was improved, but control of colour change was inferior. At Applethorpe rootstock trials with Granny Smith showed no rootstock influence on the average cell number in fruits. Average cell volume was largest in fruits from Northern Spy stocks and lowest in those on Malling XII. Fruits from seedling and Northern Spy stocks were more mature at a specified picking date than those from M.XII and M.XVI. Root lesion nematodes, *Pratylenchus coffeae*, disappeared in 9 months from soils maintained under conditions of moist fallow; glasshouse pot experiments with apple seedlings showed that soil fumigation with D-D gave satisfactory nematode control.

3446. Coutanceau, M.
Le répartition géographique des cultures fruitières en France et les prévisions de récolte 1954. **(The geographical distribution of fruit crops in France and the yield forecast for 1954.)**
*Arbor. fruit.*, 1954, No. 4/5, pp. 3-4, illus.

Maps are presented for apple, pear, peach, apricot, plum and cherry distribution in each French Department.

3447. Lavigne, —.
Étude sur des cultures fruitières en Haute-Savoie. **(Study on fruit growing in Haute-Savoie.)**
*Arbor. fruit.*, 1954, No. 4/5, pp. 11-13, illus.

Cultural methods used for apples and pears in the Haute-Savoie area of France are described. Reinette blanche de Canada is the main apple variety, grafted on Malling II or IX. The tree forms used with the different rootstocks are described; they entail considerable pruning. Alexandrine Douillard and Williams are the best of the pears. They are also grown in forms demanding much pruning. A co-operative moss store is described.

3448. Novel, P.
L'arboriculture fruitière au Maroc. **(Tree fruit growing in Morocco.)**
*Rev. hort. Paris*, 1954, **126**: 1093-5, illus.

Figs, almonds, dates, apricots, plums, apples, pears, and quince are the main crops mentioned. Cherry, pomegranate, walnut, medlar, avocado, pecan, cherimoya, guava and feijoa are also grown.

3449. Dragavcev, A. P.
**Fruit growing in the mountains of Tian-Shan.** [Russian.]
*Priroda*, 1954, **43** (5): 77-84, illus.

Tian-Shan in Central Asia, covering an area some 1,600 km. long and in the west 600 km. wide, is the largest mountain range in the U.S.S.R., with its eastern part stretching into China. After an outline of the topography, climate and soil types of the area, the possibilities of fruit production in suitable districts are discussed. In the west some 50 fruit species, including apples, apricots and walnuts, grow wild. Cultivated apple trees grown up to an altitude of 1,200–1,300 m. are stated to be long-lived and to produce fruit of high sugar and vitamin C content which stores remarkably well. At higher altitudes growth is more restricted, and of the varieties used Mičurin's Pepin Šafrannyi is the most suitable. Pome and stone fruits can be grown at 1,900–2,050 m. and in some sheltered orchards up to 2,500 m.

3450. Ljubenkov, A. A.
**Apricots in the Brest region.** [Russian.]
*Priroda*, 1954, **43** (3): 89-91, illus.

Apricots, grown in gardens around Brest in White Russia since 1918, produce annually an abundant crop of small but good quality fruits. They are propagated by seed, and trees which withstood the severe winters of 1928/29 and 1939/40 have produced some hardy progeny suitable for cultivation in unsheltered positions and for extending the production range of the crop.

### *Breeding and varieties.*

(*See also* 3470, 3471, 3493, 3539w, x, 4484.)

3451. Lewis, D., and Crowe, L. K.
**The induction of self-fertility in tree fruits.**
*J. hort. Sci.*, 1954, **29**: 220-5, bibl. 10.

A method of producing self-fertile varieties of fruit trees is described. X-radiation is used to damage the incompatibility (S) gene, and the sieving mechanism of incompatibility is used to select, out of millions, the few S genes which have been damaged. Pilot experiments with the self-sterile *Oenothera organensis* provided a technique which has been successfully applied to sweet cherries and to apples and pears. X-rays, given to pollen mother cells of sweet cherries, increase the production of fruit and seed, after incompatible pollination, approximately tenfold. The most suitable stage of development for X-ray treatment in cherries is the resting stage, for only then are permanent complete mutants produced. The best dosage is about 800 r units for cherries. 10% of the progeny obtained after X-radiation and incompatible pollination in cherries are fully self-fertile. In *Oenothera*, crosses of these self-fertile plants with self-steriles have, according to the cross, given either a half or all self-fertile progeny. Thus large families of self-fertile seedlings can be produced giving an adequate range from which to select self-fertile plants of high quality. The advantage of inbreeding for releasing new variation such as extreme earliness, which has been found among the self-fertile cherry seedlings, is discussed. The loss of vigour due to the continued inbreeding, which is possible with self-fertility, may be a source of dwarf varieties and rootstocks. [Authors' summary.]—John Innes Hort. Instn, Hertford.

3452. Granhall, I.
**Spontaneous and induced bud mutations in fruit trees.**
*Acta Agric. Scand.*, 1954, **4**: 594-600, bibl. 26.

The present situation in fruit tree mutations is discussed. In both natural and induced bud sports, apples most frequently give red fruits, and pears most often give striped and russeted fruits. In experiments in Sweden the most adaptable way of inducing mutations seemed to be by $\gamma$-radiation from a $Co^{60}$ source. In comparison with ordinary cross-breeding methods, mutation breeding seems to be time-saving: the comparatively small changes in genotype and gene balance may mean a shorter testing period than that which is now necessary to develop a cross-bred variety.

3453. Bishop, C. J.
**Mutations in apples induced by X-radiation.**
*J. Hered.*, 1954, **45**: 99-104, bibl. 14, illus.

Dormant scions of the diploid apple varieties Yellow Bellflower, Cortland, Sandow and Golden Russet were treated with 3,500 to 4,000 *r* of X-rays and frameworked onto mature trees. Early scion growth showed abnormalities in the leaves and bifurcation of the branches;

the X-rays also caused abnormally short, thick shoot development, and induced early flower bud formation. In the 2nd season, fruits of a large size and irregular shape were produced; of 150 apples examined, 9 were sectorial colour chimaeras. Colour changes were observed in the direction of more and less red colour, and fruit from X-rayed scions showed more and wider sectors than fruit from normal trees. The results indicate the possibility of using X-rays to induce colour gene mutations in apples.

3454. Anon.
**Results of apple breeding work.** [Japanese, with English summary 4 pp.]
*Bull. Aomori Apple Exp. Stat.* **4,** 1953, pp. 103, bibl. 20, illus.

Fruit characters and tree performance were studied in 1946/49 in hybrids of some well-known varieties, including Delicious, Jonathan and McIntosh. Brief descriptions are given of 14 named varieties which have been bred since 1928 and of which the fruits are said to be equal to those of the best commercial varieties.

3455. Lalatta, F.
Le mele del gruppo Delicious. **(The apples of the Delicious group.)**
*Ital. Agric.*, 1954, **91**: 435-44, illus.

Distribution in Italy, varieties, botanical and cultural characters, training, resistance to late frosts, diseases and pests, marketing.

3456. Schütze, E.
Der Gelbe Holsteinische Cox. **(The Yellow Holstein Cox.)**
*Mitt. ObstbVersuchsringes Jork*, 1954, **9**: 189-90.
Loewel, E. L., and v. Vahl, E.
Unsere bisherigen Erfahrungen mit dem Holsteiner Cox. **(Observations on the Holstein Cox.)**
*Ibidem*, 1954, **9**: 191.

The Yellow Holstein Cox or Holstein Cox is a triploid seedling of Cox's Orange with a flavour similar to that of the parent variety. Holstein Cox shows vigorous growth, bears regularly and is less exacting in its demands than Cox's Orange, but there is an excessive tendency for young trees to drop their fruit prematurely. General introduction of the variety in the Jork area cannot be recommended until the completion of the trials laid down in many orchards.

3457. Dermine, E., and Liard, O.
A propos d'une variété inconnue du prunier. La variété No. 521. **(An unknown plum variety, No. 521.)**
*Fruit belge*, 1954, **22**: 113-20, illus.

A late ripening plum variety, found growing in an orchard at Ath and classified as No. 521, is described in detail. The fruit ripens about 1 October, and is large, reaching 55 to 60 mm. in length, with an average diameter of 50 mm.

3458. White, D. G., and others.
**New fruit varieties.**
*Sci. for the Fmr*, 1954, **1** (4): 10-11.

Short reports are given on the behaviour of new fruit varieties grown under Pennsylvanian conditions. Temple was the best strawberry variety for most conditions and Latham the best raspberry. Wilder red currants gave the highest yield, but Viking was also valuable as it is immune to white pine blister rust. Information is tabulated on new peach and apple varieties.

### *Propagation and rootstocks.*

(*See also* 3445, 3529, 3574, 4458.)

3459. Visser, T.
**After-ripening and germination of apple seeds in relation to the seed-coats.**
Reprinted from *Proc. kon. ned. Akad. Wetensch., Series C*, 1954, **57**: 175-85, bibl. 14.

Experiments were carried out to discover the roles of endosperm and integuments in after-ripening and germination of apple seed. The endosperm appears to have some effect on after-ripening although it is not an essential effect; the integuments have no marked influence. Both the endosperm and the integuments hindered the germination of insufficiently after-ripened seeds considerably, but the hindrance caused by the integuments was due mainly to mechanical resistance. The part played by the endosperm in both after-ripening and germination is possibly the same and is restricted to physical obstruction of respiration.

3460. Kuznecov, M. D.
**A trial on raising apple seedlings in soil blocks.** [Russian.]
*Sad i Ogorod*, 1954, No. 3, pp. 56-7.

Apple seedling rootstocks grew well in nutrient cubes made of peat to which 20% cow dung and 1% lime were added [see also *H.A.*, 22: 3394]. Blocks made of lowland peat, pH 6·1, were more satisfactory than those made of sphagnum peat, pH 5. When 3 levels of NPK, NP, NK and PK were included in the sphagnum peat blocks, the lowest nutrient level (0·5 g. N, 1 g. P and 1 g. K per 1 kg. peat) mixture and the controls produced the best plants. Of the nutrient combinations used NP gave the best results. The addition of 0·5% lime, bringing the pH up to 5·5–6·0, was better than the 1% rate used originally. Growing seedlings at the rate of 2, 3 and 4 per pot increased their frost resistance and early growth, but those grown singly eventually produced more vigorous plants.

3461. Kester, D. E.
**Factors affecting the aseptic culture of Lovell peach seedlings.**
*Hilgardia*, 1953, **22**: 335-65, bibl. 49, illus.

Factors affecting the germination and growth of Lovell peach embryos were investigated, using a technique consisting of aseptic stratification of seeds, followed by aseptic culture of the embryos on nutrient agar. The studies showed that reduction in the amount of cotyledons reduced over-all growth, and their complete removal prevented germination; root length was not reduced until about 90% by weight of the cotyledons was removed; injury resulted in initial stimulation of shoot growth. Sucrose addition, which tended to be inhibiting when cotyledons were present, gave increased stimulation with cotyledon reduction, and allowed germination in embryos with no cotyledons, although growth was maintained for only 10 to 14 days and was somewhat abnormal. In darkness, inhibition in root elongation was evident. The functions of the cotyledons seemed to be to produce growth of shoots, leaves and roots, and to provide a stimulus for growth after germination had started, one-sixteenth of the cotyledons being sufficient to carry out these functions. The effect of the cotyledons was not replaced by any of the substances used, although some had a slight stimulatory effect. A similarity between growth of embryos with cotyledons removed, and that of excised immature embryos and of non-after-ripened embryos is pointed out and discussed.

3462. Garner, R. J., Hatcher, E. S. J., and Nicoll, C. P.
**Experiments with apple leaf-bud cuttings.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 145-9, bibl. 8.

By growth substance stimulation leaf-bud cuttings of the apple rootstock variety M.V have been induced to root, but the ordinary leaf cutting failed to do so. It was found that the reacting tissue was the small piece of attached stem, and not the axillary bud nor the petiolar base. Rooting behaviour of the leaf-bud cutting is influenced by position on the shoot, and the time of separation from the shoot. Its possible use as an indicator of propagative capacity is discussed. [Authors' summary.]

3463. Graham, S. O., and Blodgett, E. C.
**Some new developments in vegetative propagation of stonefruits.**
*Proc. annu. Mtg Wash. St. hort. Ass.*, 1953, **49**: 117-19, illus.

The method and materials used in the propagation of *Prunus mahaleb* by softwood cuttings [see *H.A.*, 24: 1172] were also found satisfactory for myrobalan and peach rootstocks.

3464. Pinskver, E. M.
**Vegetative propagation of the fig.** [Russian.]
*Sad i Ogorod*, 1954, No. 6, p. 73, illus.

A note indicating that under the hot, dry conditions of the southern Ukraine propagation of fig by cuttings is more successful than by seed. In 1953, 95% of the seedlings were lost, mainly through drying winds, as against 8·5% of the cuttings.

3465. Budagovskiĭ, V. I.
**Quicker methods of propagating dwarf rootstocks.** [Russian.]
*Sad i Ogorod*, 1954, No. 7, pp. 39-41, illus.

The desired dwarf apple rootstock is budded on a vigorous seedling rootstock and in the early spring of the third year its stem is cut back to one-third and layered. By this method 12–15 well rooted layers are obtained from the original single bud of the dwarf rootstock. Another system described consists of inserting a bud of a dwarf rootstock below that of a scion variety worked in the normal way on a vigorous rootstock. The shoot of the variety is grown in the conventional way while that of the dwarf rootstock is pegged down and rooted. It can later be separated and transplanted.

3466. Lepage et Cie.
Influence du mode de greffage sur la production chez le pommier. **(The influence of grafting methods on apple tree production.)**
*Arbor. fruit.*, 1954, No. 4/5, p. 26.

Experiments in France started in 1942 were designed to evaluate the effect on yield of root-grafting apples. Winter Banana, Red Delicious, King David, Reinette du Mans and Cox's Orange Pippin were grafted onto the rootstock in 3 ways, namely onto root pieces, by whip grafting onto the root collar, and by budding above the collar. Yields, averaged over 4 years, showed that root-grafted trees of Winter Banana, Red Delicious and King David were more productive than budded trees, but that budded Cox trees were more productive than root-grafted trees although the difference was not marked. Results with Reinette du Mans were inconclusive.

3467. Thompson, E. C., Roach, W. A., and Preston, A. P.
**The reinvigoration of apple trees by inarching.**
*J. hort. Sci.*, 1954, **29**: 175-83, bibl. 3, illus.

This article forms a final report on a 16-year investigation into the reinvigoration of Grenadier apple trees on Northern Spy and Malling Crab H rootstocks by inarching with M.XVI [see *H.A.*, 7: 25]. The effect of inarching, as shown by dye injection and pomological data, was still unevenly distributed amongst the main branches according to the position of the inarches. More even distribution of the invigorating effect may be obtained by more careful inarch placing. The excavated root systems of 4 trees showed several natural root grafts. Root excavations of trees on Northern Spy inarched with M.XVI showed that the superiority of the trees to those not inarched was not due to an extensive inarch root system, but it is suggested that the deep roots of the inarch system aided the shallow Northern Spy roots by penetration to a moist B soil horizon.—E. Malling Res. Stat.

3468. Thiel, K.
Histologische Untersuchungen an nicolierten Okulationen. **(Histological studies on pear trees budded by the Nicolin method.)**
*Dtsch. Baumsch*, 1954, **6**: 163-5, illus.

The histology of the union of Williams and two other pear varieties with Beurré Hardy and Quince A was studied in trees worked according to the "double-shield budding" method of [Garner and] Nicolin [*H.A.*, 23: 2548 and 3813]. Sections cut in the period from a fortnight after budding until a year later show that the budless shield of the intermediate variety forms little callus; its function seems to lie in the promotion of the union of rootstock and scion in the cambial zone.

3469. Gayford, G. W.
**Rootstocks for deciduous fruit trees.**
*J. Dep. Agric. Vict.*, 1954, **52**: 255-8, illus.

Notes are given on rootstocks recommended for use in Victoria, Australia, for apple, pear, peach, plum, almond, apricot, cherry and walnut, and on work in progress at Scoresby and Tatura Research Stations.

3470. Johansson, E.
Sort- och grundstamförsök med äpple vid Tosemarken och Ekerum 1941–1953. **(Apple variety and rootstock trials at Tosemarken and Ekerum 1941-1953.)** [English summary 2 pp.]
*Medd. Trädgårdsförs. Malmö* **87**, 1954, pp. 22, bibl. 3, illus.

In these trials 14 apple varieties (dessert and others) were tested on M.II, IV, XVI, A2 and A3 rootstocks, the last two being almost identical. At Tosemarken on the west coast of Sweden, where the temperature in the winter of 1946/47 dropped to −32° C., many trees of all varieties were killed on M.IV. Data on vigour and yield are tabulated for all varieties on the different rootstocks tested. With most varieties the size of the fruits was smallest on M.II, but quality was not affected by rootstock.

3471. Johansson, E.
Sort- och grundstamförsök med päron vid Alnarp 1941-1953. (**Pear variety and rootstock trials at Alnarp 1941-53.**) [English summary $1\frac{1}{4}$ pp.]
*Medd. Trådgärdsförs. Malmö* **85**, 1954, pp. 16, bibl. 5.

Data are tabulated on vigour, yield, and fruit size of several pear varieties worked on the Malling quince selections A and C and on the Swedish selection A6, with and without intermediates. The trials, which are being continued, are on a small scale.

3472. Woodhead, C. E., McKenzie, D. W., and Farmer, A.
**Apple rootstock trials. I. Sturmer on East Malling stocks, Northern Spy, and own roots.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **35**: 497-504, bibl. 2, illus.

The growth and cropping of Sturmer on Northern Spy, " own roots" and five East Malling rootstocks in the 12 years following planting are described. M.XII was the most vigorous stock. The next largest trees were those on M.XV and "own roots", which were of similar size. The least vigorous stocks were Northern Spy, included as a check, and the rootstocks M.I, M.XIII and M.XVI, which did not differ significantly from Northern Spy. Total production of fruit for the 12-year period was highest on M.XII and "own roots", both of which gave similar yields. Next, but considerably lower in production, were Northern Spy and M.I, M.XV and M.XVI, none of which differed significantly from Northern Spy. M.XIII gave a lower yield than Northern Spy. Considered in relation to size of tree, cropping was delayed by M.XII and M.XV. "Own-rooted" trees, although similar to M.XV in vigour, were remarkable for precocious bearing. From the aspect of early cropping combined with heavy total production and adequate vigour, "own-rooted" trees show considerable promise at this stage of the trials. However, trees on M.XII with a similar total production are now yielding heavier crops. [Authors' summary.]

3473. Briand, —.
Notes sur la haie fruitière à Meknès. (Pommiers et poiriers.) (**Notes on apple and pear fruit hedges at Meknès.**)
*Terre maroc.*, 1954, **28**: 202-4.

Vigorous or moderately vigorous varieties and vigorous rootstocks are required for hedges trained by the arcure method. The best apple rootstocks are M.XVI, M.I and M.II and recommended varieties include Winter Banana, Jonathan, Rome Beauty, Stayman Winesap and Golden Delicious. The best pear rootstocks are Provence quince and pear seedlings, and recommended varieties include Williams, Conference, Beurré Hardy, Packham's Triumph and Beurré Clairgeau.

3474. Stepanov, S. N.
**Apple rootstocks in the central fruit producing zone of RSFSR.** [Russian.]
*Sad i Ogorod*, 1954, No. 7, pp. 34-9.

From an evaluation of apple rootstocks used in the producing areas of the largest of the 16 constituent republics of the U.S.S.R., Kitaika [*Malus prunifolia*] appears to be generally the most acceptable. Other rootstocks discussed include Siberian crab, seedlings of various Siberian varieties, seedlings of some cultivated varieties and the wild forest apple.

3475. Vyvyan, M. C., and Maggs, D. H.
**Progress in the study of rootstock-scion interaction.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 141-4, bibl. 22.

An account is given of past experiments, notably at East Malling, and of a new experiment designed to study the mechanism of the reciprocal effect of stock and scion on growth and form in young apple trees. The treatments chosen in the new experiment, laid down in 1950, were a symmetrical combination of 4 rootstock varieties in pairs, together with the unworked stocks. No results are given.

3476. Tydeman, H. M.
**A description of certain M.IX crosses.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 86-8, plus 2 tables and 9 plates, bibl. 4.

Detailed tabulated descriptions supported by illustrations are given of both the summer and winter characters of 6 new apple rootstocks selected from crosses between M.IX and M.VII, M.XII, M.XIII and M.XVI.

3477. Preston, A. P.
**Apple rootstock studies: the M.IX crosses.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 89-94, bibl. 9, illus.

First results are presented of field trials of a series of new apple rootstocks, the M.IX crosses, bred at East Malling by crossing M.IX with certain other Malling rootstocks. Data are presented for rootstock effect upon vigour, suckering propensity, fruit bud formation, anchorage, fruit yield, and crop per unit area of trunk cross-section. Comparable trees on Malling rootstocks afforded standards for comparison. Trees on the very dwarfing rootstocks suckered more severely than those on more vigorous ones but one dwarfing rootstock proved an important exception. The behaviour of five new rootstocks, as possibly of promise, is discussed in detail and in relation to existing rootstocks. [Author's summary.]

3478. Garner, R. J., and Keep, E.
**A sport in the apple rootstock Malling XIII.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 121-2, bibl. 5, illus.

A sport found in the vegetatively propagated apple rootstock M.XIII is described. Chromosome counts show that the roots of the normal clone are diploid, those of the sport tetraploid. The similarity in size of the stomata of both suggests that the epidermis of the sport may be diploid. [Authors' summary.]

3479. Maurer, E., and Hilkenbäumer, F.
Das Verhalten bekannter und neuer vegetativ vermehrter Apfelunterlagen während der Zeit des Ertragsanstieges in Schwäbisch Hall. **(The behaviour of old and new clonal apple rootstocks at Schwäbisch Hall during the period of yield increase.)**
Reprinted from *Z. Pflanzenz.*, 1954, **33**: 99-118, bibl. 4.

In 1940 an experimental apple orchard of 5½ hectares was established at Schwäbisch Hall, Württemberg, on a fairly heavy loam soil (pH 7·0–7·2) with a tendency to waterlogging, at an altitude of 445 m. and with a mean annual rainfall of 900–950 mm. The 17 M. rootstocks and the 29 clonal Dahlem rootstocks tested were worked with the varieties Boskoop, Gold Pearmain, Ontario and Berlepsch. The data on growth, yield (per tree and per area) and quality presented for the 7th, 8th and 10th–12th years conform, on the whole, with the observations made elsewhere with M rootstocks. The only Dahlem selection meriting general interest appears to be Da 103, which combines good anchorage with the desirable characteristics of M.IV.

3480. Plock, H.
Die Stamm- bzw. Gerüstbildnersortenfrage in rauhen Höhengebieten und Gebirgslagen. **(The choice of varieties for stem- and frame-builders in rough highland localities.)** [English, French, Spanish summaries.]
*Mitt. Klosterneuburg, Ser. B*, 1954, **4**: 111-15.

Data are given on the behaviour of apple varieties in an experimental nursery established in southern Germany at an altitude of 850 m. The trees are to be tested as stem- and frame-builders as part of a scheme to extend fruit growing to highland and mountain areas with cold winters and short summers.

3481. Kazjmin, G. T.
**The Ussurian plum as mentor.** [Russian.]
*Agrobiologija*, 1953, No. 5, pp. 140-5, illus.

Experiments were conducted over 5 years in the Soviet Far East on budding scion wood from young seedlings of plum, cherry and apricot onto branches of *Prunus ussuriensis*. While no final conclusions were drawn from the results so far obtained, it was apparent that the Ussurian plum improved the hardiness of all 3 species, reduced the developmental period of the cherries and increased the size, sugar and dry matter content of their fruits.

3482. Bry, A.
Le "myrobolan" porte-greffe de l'abricotier. **(Myrobalan as a rootstock for apricot.)**
*Pomol. franç.*, 1953, **80**: 91-3, bibl. 5.

The author briefly discusses the use of apricot, plum, peach and almond as rootstocks for apricot, with reference to South-Western France. In this area the plums Reine-Claude and Myrobalan are the most widely used apricot rootstocks. Apricot is not a satisfactory rootstock in this area as it does not do well on irrigated or heavy soils. Peach has given satisfactory results in Rousillon. Almond is not very compatible but may be used on dry or chalky soils.

3483. Boulay, H., and R., D. L.
À propos des porte-greffes de l'abricotier. **(Rootstocks for apricots.)**
*Arbor. fruit.*, 1954, No. 4/5, pp. 14-16, illus.

These 2 short articles have been stimulated by an article on apricot rootstocks by A. Bry [see abstr. 3482 above]. M. Boulay does not agree that peach is a satisfactory rootstock for apricot in Rousillon, where it gives heterogeneous orchards, under-developed trees and weak unions. The plum Reine-Claude can be considered as the standard rootstock in this area owing largely to its ease of propagation; it is compatible with the chief varieties, but some selection of strains not susceptible to decline is desirable. The tendency to decline in trees on apricot stocks is less than in those on plum, but grafting is not so easy as on plum. Myrobalan is hardly used in this area, as it is not compatible with local varieties. Good results have been observed when peach was used as an intermediate stock for apricot on almond roots. D.L.R. discusses the plum Mariana as another alternative rootstock.

3484. Metlickiĭ, Z. A.
**Cherry rootstocks.**
Trusevič, G. V.
**On the question of cherry rootstocks.**
Oratovskiĭ, M. T.
**Cherry rootstocks in the southern Ukraine.**
Krylov, D. N.
**Cherry rootstocks in Dagestan.**
Sagač, J. A., and Topor, J. A.
**Basic cherry rootstocks.**
Jacyna, A. S.
**Cherry culture in the Stavropol region.**
[All in Russian.]
*Sad i Ogorod*, 1953, No. 8, pp. 5-12, illus.; 1954, No. 7, pp. 42-6, pp. 46-51, illus., pp. 51-4, p. 55 and p. 56, respectively.

The author of the first paper points out the desirability of extending the cultivation of cherries, and in discussing the rootstock situation in various regions considers that on the whole wild cherry [*Prunus avium?*] is preferable to mahaleb. The other authors express views, based on observations and studies in their respective localities, which in the main confirm those of the senior author. Under certain conditions, however, mahaleb is still considered more suitable as a cherry rootstock than wild sweet cherry, sour cherry or local semi-cultivated late cherries.

## *Growth phenomena.*

(*See also* 3355, 3539s.)

3485. Ljones, B., and Nesdal, O.
Årringsstudier i frukttre. **(Growth ring studies in fruit trees.)** [English summary 1½ pp.]
*Meld. norg. LandbrHøgsk.*, 1954, **34**: 131-69, bibl. 10, illus.

Records have been taken of the size of annual growth rings in fruit trees. Apple trees at the Norwegian Agricultural College were studied, using material from Åkerø on various rootstocks, several winter varieties on Malling IV, and Silkeeple growing at the top and bottom of a slope. With Åkerø a significant correlation was found between the size of the growth ring and total shoot length. Correlations between growth rings and yield were always negative, especially in biennial bearing varieties. There was a tendency for growth ring size and spring rainfall, particularly in June, to be positively correlated, and growth ring size and summer temperature, particularly the June average, to be negatively correlated. Growth rings in the variety Silkeeple growing at the top of a slope showed closer correlation with precipitation than trees at the bottom. In a manurial trial with Gravenstein on M.IV, to which sulphate of potash was being applied in increasing amounts, the growth rings confirmed that there were no growth differences due to manuring in any year after planting. Frost rings were found in both hardy and frost-susceptible varieties and were most numerous in winters with temperatures below −24° C. In the hardy variety Åkerø, frost rings were found in 13·4% of the growth rings studied, and in Gravenstein, a susceptible variety, frost rings were found in 21·5% of the growth rings. Apple, pear, plum and cherry trees growing in West Norway showed in some cases an increase in growth ring size in later periods of their life, probably as a result of the improved cultural practice of recent years. Correlations with meteorological records were less significant with this material: no frost rings were found.

3486. Pearce, S. C., and Davies, G. E.
**Studies in the measurement of apple trees. II. The height at which trunk girths should be measured.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 138-40, bibl. 1.

A study is made of the shapes of trunks of bush apple trees in a range of experiments. It appears that differences in growth brought about by pruning and potassic manuring do not affect the shape, but rootstock does, the differential taper between stocks depending partly upon the tendency of the stock to produce a large or small head in relation to trunk and partly upon the angle of the branches. It is recommended that girth should ordinarily be measured 12 inches above the graft union, with additional higher girths near the crotch in the case of rootstock trials. [Authors' summary.]

3487. MacDaniels, L. H.
**Anatomical basis of so-called adventitious buds in the apple.**
*Mem. Cornell agric. Exp. Stat.* **325,** 1953, pp. 22, bibl. 6, illus.

Studies on apple trees were made to determine the anatomical basis of the origin and distribution of buds producing suckers on trunks and large limbs. It was shown that true adventitious buds occurred freely on the roots of one-year-old seedlings and only rarely on the aerial parts; such buds were not observed on nursery or older trees. Dormant buds were found to persist in large numbers and became widely distributed over the trunk and main branches as a result of growth extension. Sucker shoot growth can be reduced by cutting the suckers off close to the trunk, but complete elimination is unlikely to result from normal orchard practice.

3488. Hilkenbäumer, F., and Buchloh, G.
Zur Histogenese der Übergangsknospen beim Apfel. **(On the histogenesis of transition buds in the apple.)**
*Gartenbauwiss.*, 1954, **1***: 7-35, bibl. 24, illus.

A third type of bud intermediate between fruit and leaf bud occurs in certain apple varieties, such as Ontario, especially as the terminal bud of tip-bearing shoots. Illustrated descriptions are given of the development of all three types of bud in bearing Gold Pearmain, Blenheim and Ontario trees.—Bonn Univ.

3489. Cerrini, U.
Anomalie nei fiori del pesco. **(Peach flower abnormalities.)**
*Ital. agric.*, 1954, **91**: 319-21, bibl. 7, illus.

An abnormality common in peach flowers in the upper Tiber valley is characterized by the presence of 1–2 small, pale, extra sepals and petals and of 2 complete ovaries which sometimes result in double fruit. It has been observed in 6 varieties, including J. H. Hale and Early Hale, especially in young and vigorous trees, is associated with high fertility and may be of genetic origin.

### *Pollination.*

(*See also* 3539n.)

3490. Guščin, M. F.
**Influence of external conditions on pollination.** [Russian.]
*Sad i Ogorod*, 1954, No. 4, pp. 53-6, illus.

Results of plum pollination experiments in Dagestan are given showing that the place of production and seasonal weather conditions affect the fruit set of both naturally and artificially pollinated flowers. Suitable pollinators for the more important varieties, often grown alone in large blocks, are listed and their interplanting with the varieties is urged. Before the required pollen is available in the orchard, however, bees can be used to transmit it from a distance. In 1953, by means of flight guidance, bees from hives placed under pollinating trees regularly visited and successfully cross-pollinated a 10-ha. plum orchard situated 1·5 km. away.

3491. Butler, C. G., and Simpson, J.
**Bees as pollinators of fruit and seed crops.**
*A.R. Rothamsted exp. Stat. 1953*, 1954, pp. 167-75, bibl. 47.

A review, discussing insufficient pollination due to several factors, the problem of cross-pollination of self-sterile plants, directing honeybees to crops and use of honeybees as pollinators in particular instances. For orchard pollination grouping of bee colonies in the centre of 15–20 acres is recommended, and the possibility of using honeybees as pollinators in confined spaces such as glasshouses and colourless nylon screen-cages is mentioned.

3492. Singh, S.
**Insect pollinators and the breeding of fruit varieties.**
*Indian J. Hort.*, 1954, **11**: 6-9, bibl. 1.

---

* New series. Vol. 18 was published in 1945.

This article includes tabulated data from the U.S.A. and the Punjab on sugar concentrations in nectars secreted by the flowers of 12 temperate and subtropical fruit species and various other plants. Bees show little interest when nectars contain less than 17% sugar. Examples are given of cases in which bees have patronized certain species to the exclusion of others growing with them.

3493. MALIGA, P.
Untersuchungen über die Befruchtungsverhältnisse bei Weichselsorten. **(Pollination studies on sour cherry varieties.)** [English and Russian summaries 2 pp. each.]
*Acta Agron. Hung.*, 1954, **4** (1-2): 105-49, bibl. 17.

Detailed results are given of 6 years' pollination experiments with the best Hungarian sour cherry variety, Pándy. The variety is not a single clone, but one consisting of different clones of different morphological characters. It is self-sterile and produces satisfactory yields once in 2 to 4 years. Suitable pollinators found for Pándy included some sweet cherry and sweet and sour cherry hybrid varieties which generally gave better results than sour cherry varieties. It varied from year to year in its capacity to become fertilized. In artificial pollination experiments Pándy did fertilize some other varieties, but under natural conditions, owing to insufficient pollen, it was found an unsuitable pollinator.

3494. MANARESI, A., AND FACCIOLI, F.
Sulla presenza del caprifico nell'Emilia e Romagna. **(On the presence of caprified figs in Emilia and Romagna.)**
*[Publ.] Accad. Sci. Ist. Bologna*, 1953, pp. 12, bibl. 21, illus.

Caprified varieties grow wild in parts of Emilia and Romagna, and *Blastophaga* is often found in the fruit. In several cultivated varieties in both districts the figs are often caprified, no doubt by *Blastophaga*, though the insect has not yet been found.—Ist. Colt. arb. Univ. Bologna.

### *Spraying for cultural purposes.*

3495. BATJER, L. P., AND ROGERS, B. L.
**Results with chemical thinning in 1953 and the possibilities of new materials for thinning purposes.**
*Proc. annu. Mtg Wash. St. hort. Ass.*, 1953, **49**: 95-7.

In Washington State in the 1953 season, the dinitro compounds (Elgetol and Krenite) seriously overthinned the blossoms of Delicious and some Winesaps, probably as a result of the combination of rain and low temperature after spraying. Tests over several years with morphaline thiuram disulphide (MTD) indicated that it has a milder thinning action on Delicious and Winesap than the dinitro compounds, but that it is not strong enough for Golden Delicious and Jonathan.

3496. BARAK, D.
**Apple blossom thinning with a sodium naphthalene acetic acid.** [Hebrew.]
*Hassadeh*, 1954, **34**: 488.

Certain apple varieties were sprayed with a NAA, heavy croppers such as Reine de Reinette at 20 p.p.m., Calville de Sainte Sauveur (Gran Alexander) at 10–20 p.p.m., Winter Banana, Rome Beauty and Golden Delicious at 10–15 p.p.m. It is inadvisable to use this method of blossom thinning on poor croppers. Sometimes a second spray at 10 p.p.m. is necessary, which may be followed by a small amount of hand thinning. Spray should be applied within a fortnight after the beginning of petal fall, and may be mixed with the usual insecticides and fungicides. The upper and outer portions of the tree should be sprayed chiefly, the inner and lower portions being of less importance. The advantages of spraying are: thinning can be done in time, fruit is bigger and ripens somewhat earlier, and the colour is better. There is also more efficient control of pests and tree health. H.C.R.

3497. BRADT, O. A.
**Chemical thinning of peaches.**
*Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab., 1951-1952*, pp. 19-25, bibl. 3, illus.

Of 3 dinitro compounds and 4 growth regulators applied to peach trees to reduce the final set of fruit, the dinitro DN No. 289 during full bloom and 3-Cl-IPC a month after full bloom were the most promising. The 2 other dinitros at the rates applied produced no thinning, while maleic hydrazide, App-L-Set 300 and an NAA dust were phytotoxic to the peach trees.

3498. ROGERS, B. L., AND BATJER, L. P.
**Size thinning of apples.**
*Proc. annu. Mtg Wash. St. hort. Ass.*, 1953, **49**: 107-12.

Data collected and tabulated over 3 seasons in Washington State on the fruit size of Winesap and Delicious, at designated days between full bloom and harvest, provide a basis for the prediction of harvest size. In this State chemical thinning is often followed by supplemental hand thinning when, by the use of this table, potentially undesirable small apples can be removed at an early stage. [See also *H.A.*, 24: 2285.]

3499. JOUVE, R.
L'accélération de la maturation des poires. Essais d'avancement de l'époque de maturité des fruits. **(Hastening the ripening of pears. Attempts to advance the ripening season of the fruits.)**
*Arbor. fruit.*, 1954, No. 3, p. 6.

Experiments were made during 1952 and 1953 to test the effect of spraying 2,4-D at varying concentrations on pear fruits. In 1952, sprays containing 0·20 g. and 0·30 g. of 2,4-D per 100 litres water were applied to Dr. Jules Guyot and Williams 2 months after flowering. On neither variety was there any subsequent leaf malformation; in Dr. Jules the apparent maturity was advanced by 8 to 10 days, but the fruit kept badly and the flesh was woolly; Williams fruit matured 10 days before the control, kept well in cold storage and tasted the same as that from untreated trees. In 1953, with the same spray strengths, there was no effect on leaf growth in either variety, the fruits were slightly larger than the control, they stored well and tasted normal. The difference in effect between the 2 years was probably due to the dry June in 1952. With a spray containing 1 g. 2,4-D used in 1953, 50% of the fruit of Dr. Jules, although maturing 6 to 8 days earlier than the control, was of only mediocre eating quality. On Williams the stronger spray advanced maturity by 4 to 5 days and had no effect on flavour.

3500. Poapst, P. A.
**Storage behaviour of McIntosh apples treated with various pre-harvest sprays.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 11-20.

In this investigation several spray treatments were applied to McIntosh apple trees as follows: 20 p.p.m. of 2,4,5-trichlorophenoxy propionic acid; 20 p.p.m. of 2,4,5-TP and 200 p.p.m. of maleic hydrazide; 200 p.p.m. of maleic hydrazide; and 20 p.p.m. of 2,4,5-trichlorophenoxy acetic acid. Results showed that the hormones applied had no effect on fruit size or colour; they did not accelerate softening rates or respiration or produce a higher rate of wastage in storage.—Hort. Div., Ottawa.

3501. Fisher, D. V., and Edge, E. D.
**Physiology of fruit in storage. The use of triethanolamine salt of 2,4,5-trichlorophenoxy propionic acid as a stop drop spray for apples.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 6-10.

The residual effect of spraying a McIntosh apple tree with 2 gal. of 2,4,5-TP at 150 p.p.m. lasted for about 3 weeks. Satisfactory control of fruit drop was obtained by sprays at concentrations of from 5 to 150 p.p.m., the amount applied per acre being approximately the same. No significant differences were found in firmness or eating quality of sprayed and control fruits. [See also *H.A.*, 23: 2641.]—Exp. Stat., Summerland.

3502. Benson, N. R.
**Nutritional sprays for fruit trees.**
*Proc. annu. Mtg Wash. St. hort. Ass.*, 1953, **49**: 160-5.

Foliar applications of the nutrients nitrogen, zinc and boron have been successfully made in eastern Washington. Zinc, which tends to russet fruit, is applied to non-bearing trees at ⅓ to ½ lb. per 100 gal., and to bearing trees at 1 lb. per 100 gal., and is applied after harvest when injury to senescent leaves is not important; 2 or 3 lb. of zinc per acre may be used as a maintenance spray. Boron may be satisfactorily applied as an annual spray, and will correct blossom blasting. Nitrogen may be safely applied as a urea spray to apples at 5 to 6 lb. per 100 gal.; urea sprays are likely to injure peaches and sweet cherries, and are not absorbed by pears or apricots.

## *Pruning and training.*

3503. Preston, A. P.
**Apple pruning trials. A progress report.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 105-10, bibl. 11, illus.

Winter pruning trials have been in progress since planting on apple trees planted in 1945–46 on two soil series [the Malling and the Lowlands]. Treatments include open-centre and delayed open-centre shapes, and established-spur, renewal and regulated methods of pruning. Results are given for the first seven years after planting in so far as they relate to Worcester Pearmain and Cox's Orange Pippin. Data are presented showing the effect of the different treatments on vigour, fruit bud formation, premature fruit drop, fruit yield and fruit size. Trees pruned to the delayed open-centre shape have so far shown no special advantages over open-centre trees. At the end of the seventh year from planting renewal pruned trees of Cox's Orange Pippin on the Malling Series had yielded more than twice as heavily, and regulated trees four times as heavily, as established-spur pruned trees. On the Lowlands Series there was no difference between the yield from renewal pruned and the established-spur trees. Regulated trees of Worcester Pearmain cropped twice as heavily as established-spur pruned trees on both soil series. Trees on the Malling Series yielded more heavily than those on the Lowlands Series except in the case of established-spur pruned trees of Cox's Orange Pippin. Premature fruit drop on Cox's Orange Pippin in the dry season of 1952 was progressively less with the lighter methods of pruning. Some trees of Cox's Orange Pippin, deblossomed for six years, were allowed to crop in their seventh year. For renewal pruned and regulated trees this crop was almost as heavy as the accumulated crops, over the whole seven years, from similar trees that had not been deblossomed. The results are discussed. The regulated method would appear to be well worth while for temporary trees, but further work is necessary before it can be recommended for permanent trees. [Author's summary.]

3504. Preston, A. P.
**Pruning young apple trees by the regulated method.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 200-1, illus.

The treatments involved from year to year in this light method of pruning are described with the aid of photographs. Fourteen dessert varieties pruned in this way have responded well and only with Ellison's Orange growing on a sandy soil has branch breakage been at all severe. [See also preceding abstract for an experiment in which regulated pruning is being compared with other methods.]

3505. Žučkov, N. G.
**Methods of accelerating bearing in fruit trees.** [Russian.]
*Priroda*, 1954, **43** (6): 104-6, bibl. 1, illus.

Methods used to induce early production in fruit trees are divided into 3 groups, i.e. biological, namely the development of early producing varieties and those with naturally dwarf habit; surgical or phytotechnical, namely direct treatment of plants; and agrotechnical, or those affecting conditions of growth. Direct treatments discussed here at some length may be of short term effect such as ringing, pruning of shoots and roots, bending of shoots, transplanting, etc., or of long term or permanent effect such as working on dwarf rootstocks, double grafting, training to prostrate form and cultivation in pots or tubs.

## *Manuring, soil management and irrigation.*

(*See also* 3416, 3436, 3539a, p, t, 3778, 4453, 4491.)

3506. Liard, O.
À propos de quelques essais sur la fumure des arbres fruitiers. (**Some experiments on fruit tree manuring.**)
*Fruit belge*, 1954, **22**: 81-8.

A series of experiments near St. Trond on apple and pear trees, growing on similar soils, were designed to evaluate the effect of varying rates of fertilizer application on fruit production. The basic formula for the fertilizer was 1·0 N, 0·8 $P_2O_5$ and 2·0 $K_2O$, applied in single, double and treble doses as a top-dressing or by soil injections. The results, based on the weight of fruit harvested, led to the following conclusions: in general the average production of a tree was not affected by the manurial treatment, although certain soils appeared to favour the action of large doses of fertilizer after a certain number of years; fruit trees on such soils, which were given heavy dressings of fertilizers in a year of good production, gave improved yields in the same year; heavy dressings did not appear to have injurious effects on the trees, nor was growth depressed by light dressings; good vegetative growth was maintained by the lowest of the 3 rates of application, but this is not necessarily the optimum.

3507. **Oland, K.**
**Nitrogenous constituents of apple maidens grown under different nitrogen treatments.**
*Physiol. Plant.*, 1954, 7: 463-74, bibl. 14.

Growth measurements and chemical analyses of apple maidens grown in quartz sand and receiving either (*a*) $NO_3$ in nutrient solution, (*b*) urea sprayed on the leaves or (*c*) no N, have given the following results: (1) No-N and urea plants showed the same growth rate and practically the same nitrogenous constituents both qualitatively and quantitatively. They are referred to as plants low in N. (2) The $NO_3$ plants grew better than plants low in N in the latter half of the growing season, and were about 25% taller by the autumn. (3) The older parts of the low N plants were largely depleted of soluble N, whereas large amounts accumulated in the $NO_3$ plants, the proportion being about 1:20. (4) Of the soluble compounds, the amides, mainly asparagine, appeared to change most in quantity from the low to the high N plants. The amounts of glutamine changed very little, only rising to a somewhat higher level in the new growth. (5) Argenine was in quantity the main amino acid of the $NO_3$ plants and of all "maidens". In the older parts of the low N plants the amounts were comparatively small. (6) In the low N plants there was a 3- to 4-fold increase in $\gamma$-amino butyric acid in the order "maiden" < "stock" < "roots". (7) In general plant parts consisting of primary growth were highest in protein N. This was, however, masked in the plants supplied with $NO_3$ as the treatment caused a great increase in nitrogen content, and protein formation is strongly influenced by N level. (8) A new test for N fertilizer requirement, based on variations in the amounts of soluble N, is discussed. A quick ninhydrine test might be possible. [From author's summary.]—Biochem. Inst., Helsinki.

3508. **Lains e Silva, H.**
Interpretação estatística de dois ensaios de campo. (Variedades de batata e adubação de pessegueiros.) **(Statistical interpretation of two field experiments. (Potato varieties and peach orchard fertilization.))** [English and French summaries each $\frac{3}{4}$ p.]
*Bol. Junta nac. Frutas*, 1952, **12**: 116-31.

The peach experiment was a 2×2×2 NPK factorial experiment in randomized blocks of 10 trees each. A statistical interpretation of the results is made. NP and NPK gave significant increases in numbers of peaches per tree as compared with N alone. Neither NK, PK nor any of the fertilizers alone significantly increased yields as compared with control.

3509. **Anon.**
**New orchard "chipper".**
*Fruit World, Melbourne*, 1954, **55** (5): 19, illus.

An implement designed to fit all tractors with a hydraulic lift is described, which will cultivate the soil round orchard trees. This operation is done by an offset gang of scalloped discs, a simple adjustment to which enables the soil to be worked up to or away from the trees.

3510. **Upshall, W. H., and Archibald, J. A.**
**Frequency of mowing in a sod-mulch apple orchard.**
*Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab., 1951-1952*, pp. 13-14, bibl. 1.

One half of a mature apple orchard was mowed twice yearly, the other half four times. After 5 years of this treatment no significant differences in tree growth or yield, size or quality of fruit have been found. The dry weight of grass obtained from 4 mowings was, however, about one-third more than that obtained from 2 mowings.

3511. **van Haarlem, J. R.**
**Sod culture for peach trees.**
*Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab., 1951-1952*, pp. 7-10, bibl. 1, illus.

Of 4 methods of soil management, consisting of 2 green manure crops and 2 grass sod treatments, used in a seedling peach orchard since 1945, sod plus a thick mulch around the trees within the spread of branches gave the most satisfactory growth and fruiting. The type of mulch material did not appear to be so important as the maintenance of a suitable thickness, about 4 in., of mulch. The sod plants required additional N, and as the soil under grass became more acid an application of 2 tons of lime per acre was needed in 1949. Observations have shown that neither sod nor sod-mulch contributed to brown rot infection by harbouring mummied fruits.

3512. **Rämsch, H.**
Untersuchungen über pilzliches und bakterielles Vorkommen in der Bedeckung von Rapsstroh. **(The incidence of fungi and bacteria on rape straw used for mulching.)**
*Arch. Gartenb.*, 1954, **2**: 127-31, bibl. 2.

Rape straw and other materials that had been used for mulching in a fruit plantation were examined for the incidence of fungi and bacteria. The results are tabulated with special reference to actinomycetes and *Azotobacter*.—Inst. Gartenb., Dresden-Pillnitz.

3513. **Rebour, H.**
La conduite de l'irrigation dans les cultures fruitières en Algérie. **(Orchard irrigation in Algeria.)**
*Bull. Dir. Agric. Algér.* **72**, third edition, 1954, pp. 48, illus.

This bulletin, previously published in 1942 [*H.A.*, 14: 1530] and 1945 [*H.A.*, 16: 692], explains orchard irrigation by means of a large number of diagrams, which, it is hoped, will help farm workers to understand the movement of water in the soil, and the methods and control of irrigation.

### *Composition.*

(*See also* 3414.)

3514. Emmert, F. H.
**Foliar analysis of apple trees. 1. Effect of yield and sampling position.**
*Progr. Rep. Storrs agric. Exp. Stat.* **3**, 1954, pp. 7, bibl. 12.

Leaves from McIntosh apple trees were collected throughout each of 2 growing seasons from tip shoot, base shoot, and spur positions, and analysed for N, P, K, Ca and Mg. Consistent differences between samples were shown for all nutrients except P. Leaves from bearing and non-bearing Baldwin apple trees in the same orchard block were collected in early August and analysed. Leaves from bearing trees were higher in N and Ca, but lower in K and P, than those from non-bearing trees; no significant difference was noted for Mg. The importance of considering sampling position and bearing condition of the tree when using foliar analysis standards is discussed.

3515. Richter, B.
Stoffwechselphysiologische Vorgänge bei der Blüten- und Fruchtbildung der Obstgehölze. (**Physiological processes occurring during the blossom and fruit formation of fruit trees.**)
*Arch. Gartenb.*, 1954, **2**: 101-26, bibl. 76.

The information assembled in this review is presented under the following heads: I. Introduction. II. Seasonal changes: (*a*) water balance, (*b*) nitrogen compounds, (*c*) mineral substances, (*d*) carbohydrates, (*e*) acid content, (*f*) fatty substances, (*g*) tannins, (*h*) pigments, (*i*) enzymes, (*j*) ascorbic and dehydroascorbic acid in fruits, (*k*) respiration of fruits. III. The role of flowering hormones. IV. Summary.

3516. Kozlovskiĭ, V. S.
**The poison in plum, cherry and apricot stones.** [Russian.]
*Priroda*, 1954, **43** (3): 112-13.

Symptoms of stone fruit seed poisoning, particularly in children, caused by hydrocyanic acid are described and remedies are suggested.

### *Storage.*

(*See also* 3368, 3539j, q, r.)

3517. C.S.I.R.O., Australia.
**Fresh fruit storage.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 91-2.

Storage temperatures close to fruit freezing point prolonged the storage life of Granny Smith and Delicious apples. Green mould wastage in oranges was successfully controlled by a dip mixture of sodium phenylphenate and hexamine. Main-crop lemons picked in June at the light green to silver stage of maturity and dipped in a mixture of 2,4-D and "Shirlan W.S." were stored for 6 months in good condition. Smooth-skinned Navel oranges kept significantly better than rough-skinned Navels. Sawdust is promising as a packing material for grapes, variety Ohanez.

3518. Biale, J. B., Young, R. E., and Olmstead, A. J.
**Fruit respiration and ethylene production.**
*Plant Physiol.*, 1954, **29**: 168-74, bibl. 21.

Fourteen species of fruits from tropical, sub-tropical, and temperate zones were investigated to determine the relationship between ethylene production and respiration. Oranges and lemons showed no climacteric rise in $CO_2$ production and produced no ethylene. Fruits with a marked climacteric, except mango, showed appreciable to high rates of ethylene production. The ratio of ethylene evolution to $CO_2$ output was highest for apple, followed by sapote, pear, cherimoya, peach, papaya, feijoa, avocado, persimmon and banana. The authors suggest that native ethylene is a product of the ripening process rather than a causal agent.

3519. Porritt, S. W., and Fisher, D. V.
**The physiological condition of apples entering storage.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 74-7.

Extensive tests were made on apples arriving for storage at packing houses, to determine the physiological age of the fruit. Respiration rates were found to be greater in earlier than in later varieties, being highest for McIntosh and lowest for Newtown. There was a tendency towards a higher proportion of post-climacteric samples among the later varieties, but with McIntosh, Jonathan and Delicious, post-climacteric fruit was not correlated with late harvesting.—Summerland Exp. Stat.

3520. Hulme, A. C.
**Studies in the nitrogen metabolism of apple fruits. The climacteric rise in respiration in relation to changes in the equilibrium between protein synthesis and breakdown.**
*J. exp. Bot.*, 1954, **5**: 159-72, bibl. 15.

A close parallelism in the drift of the rate of respiration and the protein-N/non-protein-N is shown to occur both in apple fruits attached to the tree, and when detached from the tree at various stages of development and stored for several months at 12° C. In detached fruits the fall in respiration which occurs during the first 48 hours after picking is only accompanied by a concomitant fall in net protein in very young fruits in which active cell division is taking place. Subsequently, in fruit of all ages when a climacteric rise in respiration occurs it is accompanied by a net increase in protein. Over the climacteric period, although rate of respiration (R) and net protein content both rise, R rises more rapidly than protein and, subsequently, falls at a faster rate than protein. [From author's summary.] On the basis of these observations a new hypothesis is advanced to explain the respiration climacteric.—Ditton Lab., D.S.I.R.

3521. Date, W. B., and Hansen, E.
**Pectic changes in pears during storage and ripening.**
*Proc. Indian Acad. Sci., Sect. B*, 1954, **39**: 171-8, bibl. 15.

A study was made of the pectic changes in Bartlett

[Williams], Bosc and Anjou pears obtained from the Hood River Experiment Station orchard, stored at 30° to 31° C. and periodically removed for ripening and analysis. Results showed that both protopectin and total pectin increased in amount during storage in all 3 varieties, that Anjou contained more total pectin and protopectin than the other varieties, and that protopectin was possibly synthesized during storage.

3522. Eaves, C. A.
**Gas storage studies with fruits and vegetables.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 89-96.

*Apples:* McIntosh gave only fairly satisfactory results in gas storage, probably due to late harvesting; Delicious was satisfactorily stored in 5% $O_2$ and 5% $CO_2$ at 38° F., both alone and with other varieties; Northern Spy responded to artificial atmospheres at 32° and 38° F. and in cellar storage (40–45° F.), but no advantage was gained by using a low % of $O_2$; Wagener gave satisfactory results at 38° F., but became mealy in cellar storage and when stored with other varieties; Golden Russet retained its good quality after storage in 5% $O_2$ and 5% $CO_2$ at 38° F. *Pears:* Preliminary trials were made with Clapp's Favourite and Bartlett pears stored at 32° F., and using 2 gas mixtures, 5% $O_2$ plus 5% $CO_2$, and 16% $O_2$ plus 5% $CO_2$; results showed that although scald incidence was reduced, core breakdown was heavy, except with Bartlett in 16% $O_2$ plus 5% $CO_2$. *Vegetables:* Continued investigations with cabbage showed that storage in 5% $CO_2$ and 16% $O_2$ is not so satisfactory as appeared at first, due to loss of colour and cooking quality. Waxed ripe tomatoes stored at 50° F. in 5% $CO_2$ developed a bad flavour after 10 days; unwaxed fruits in 2·8% $O_2$ plus 5% $CO_2$ were firm pink after 24 days, with good flavour; preliminary trials with ethylene gas (1,000 p.p.m.) at 70° F. indicated that high temperature is as effective as this gas in accelerating tomato ripening.—Kentville Exp. Stat., N.S.

3523. Allentoff, N., Phillips, W. R., and Johnston, F. B.
**Carbon dioxide fixation in the detached apple.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 71-3.

A study was made on the rates of $CO_2$ fixation by mature McIntosh apples. The relationship between the fixation rate and external $CO_2$ concentration at 0° C. was roughly linear; at 22° C. the fixation activity rose steeply to a maximum at harvest, and remained at a high level throughout the subsequent storage life.—Chem. Div., Ottawa.

3524. Phillips, W. R., Johnston, F. B., and Poapst, P. A.
**The effect of temperature on the storage behaviour of apples.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 49-65.

Apples from McIntosh, Cortland and Lawfam trees of low foliage N content were stored at 30°, 32° and 33° F. Results showed that fungal wastage, physiological change, and ground colour changes were inhibited to a greater or lesser extent as the temperature was reduced by steps of 1° from 33° to 30° F., although the effect was not proportional to the temperature drop. Temperature appeared to have an effect only in the ultimate stages of core flush development. There was a general indication that temperature reductions induced lower ethylene production, lower acid losses, and lower accumulation of reducing sugars until the later stages of storage.—Hort. Div., Ottawa.

3525. Fisher, D. V., Edge, E. D., and Porritt, S. W.
**Physiological breakdown of the apple. A study of factors associated with breakdown in the Spartan apple.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 44-8.

Comparison was made between Spartan apples from normal and breakdown-susceptible orchards under different storage conditions. There was no apparent correlation between development of breakdown in apples and storage treatment. Apples stored at 32° F. seemed firmer than other lots on removal from storage; apples stored at 30° and 32° F. had much better flavour than those stored at 36° F.—Summerland Exp. Stat.

3526. Eaves, C. A.
**Shrinkage of Golden Russet apples in relation to relative humidity and air movement.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, p. 88.

Observations made on the effects of humidity and air movement on shrinkage of Golden Russet apples in refrigerated storage showed that moving air did not affect fruit stored at a relative humidity of 88% to 90%. Fruit in cellar storage (40° F.) at R.H. 60% to 65% showed severe shrinkage after 2 months in circulating air.—Kentville Exp. Stat., N.S.

3527. Eaves, C. A.
**Storage quality of Cortland apples as influenced by tree nutrition.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 21-4.

Results show that acid loss in Cortland apples was associated with the application of P and N, and that K served to offset this effect. [See also *H.A.*, 23: 2589.]—Kentville Exp. Stat., N.S.

3528. Hill, H., Nichol, W. E., and Phillips, W. R.
**Relationship between the nitrogen content of the fruit and storage quality of the McIntosh apple.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 25-6.

Results from this preliminary study on McIntosh apples show that analysis of fruit N, especially of the soluble fraction, offers a means of estimating fruit storage quality.—Hort. Div., Ottawa.

3529. Nelson, S. H., and Phillips, W. R.
**Apple stem-builder versus fruit storage.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 27-9.

The effect of several stem-builders on the storage quality of McIntosh apples was studied. With apples stored in a room cooled by suspended coil and convection air currents, the most favourable rootstock combination was McIntosh on Antonovka as a stem-builder and Antonovka roots. Storage in a room with a blower coil having forced air circulation gave the best results with apples from trees with Anis as a stem-builder on Anis roots.—Hort. Div., Ottawa.

3530. Carlone, R.
Prove comparative sull'efficienza di alcune materie plastiche nel ridurre la perdita in peso durante la conservazione delle mele. **(Trials with plastics for the control of moisture losses in apples during storage.)** [English summary ½ p.]
*Ann. Sper. agrar.*, 1954, **8**: 773-80, bibl. 5, illus.

Sidathene and polyvinyl chloride bags were used in storage tests with Delicious and Golden Delicious apples. After 71 days' storage (1) loss of weight was 70–79% less than that in the controls, (2) freshness and flavour were well maintained in the sidathene-wrapped fruit, (3) the skin and pulp were discoloured and the flavour was unpleasant in the polyvinyl-chloride-wrapped fruit.—Ist. Colt. arb., Univ. Torino.

3531. Truscott, J. H. L.
**Gas storage of peach.**
*Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab., 1951-1952*, pp. 77-8, bibl. 3.

Results of 2 years' experiments indicated that gas storage of peaches is not likely to be of commercial value.

### *Grading and marketing.*

(*See also* 3539b.)

3532. Grindrod, J.
**Interesting new Dutch motorless fruit grader.**
*Comm. Gr*, 1954, No. 3052, p. 1385, illus.

A description is given of a circular grading machine being made in Holland under a German licence, which needs neither motor nor hand power to operate it. The machine is able to sort pears and apples according to size, the fruit by its own weight setting a disc and ring in motion. A semi-circular collecting table contains 10 compartments. The capacity of the machine ranges from 750 to 1,500 kg. (1,654 to 3,307 lb.) per hour.

3533. Stoll, K.
Aus der Prüfung von Obstsortiermaschinen. **(Tests of mechanical fruit graders.)**
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 390-3, illus.

Four fruit grading machines, which were tested at Wädenswil, are described and illustrated.

3534. Anon.
**Water way for cherries.**
*Agric. Res.*, 1954, **2** (12): 19, illus.
**Cherries floated to cannery.**
*Wis. Hort.*, 1954, **44**: 206.

Experiments over 2 years at Michigan Experiment Station have shown that cherries may be successfully transported from orchard to cannery in tanks of water mounted on a truck chassis. The tanks had a capacity of 10 tons of cherries, and were first almost filled with cold water, then, when full of cherries, the water was circulated until field heat was removed. The fruit arrived cool and with less bruising at the cannery, where unloading costs were also reduced.

### *Processing.*

(*See also* 3539d, h, k.)

3535. Dried Fruit Processing Committee.
**Drying and processing tree fruits.**
*J. Dep. Agric. S. Aust.*, 1954, **57**: 381-9, 433-5, illus.

The methods used in Australia for drying apricots, peaches, pears, nectarines and prunes are fully described. Apricots are picked when "eating-ripe", halved, and sulphured in specially designed chambers. The legal maximum of sulphur dioxide in dried fruits in Australia has recently been raised to 21 grains per lb. After sulphuring the fruit is quickly exposed to the sun for drying. Peaches, pears and nectarines are treated in the same way. The usual method of marketing apricots is in a "moist-pack" and for this the fruits are immersed in a hot or cold dip, or steamed; sodium or potassium metabisulphite is generally used as a hot dip. For good storage of apricots for export the moisture content should not be more than 20%. Among prunes the varieties d'Agen and Robe de Sargeant are most suitable. Fully ripe fruits are harvested and given a near-boiling caustic dip, before sun drying. Dessert prunes are further processed by steaming or in hot water before canning. In the second part of the article details important for obtaining high grade products are summarized, pest control methods stated, and methods of determining the sulphur dioxide and moisture contents of the fruit are given.

3536. Rentschler, H., and Tanner, H.
Die Fruchtsäuren schweizerischer Mostobstsäfte. **(The acids of Swiss fruit musts.)**
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 231-6, bibl. 7, illus.

Chromatograms of the fruit juice from cider apple and perry pear varieties are briefly discussed. A full account of the work is to be published in *Mitt. eidg. Gesundh-Amt.*, 1954, Vol. 45.

3537. Crnčević, V.
Proizvodnja soka iz šljive požegače. **(Production of juice from the Požegača plum variety.)** [English summary 1 p.]
*Arh. poljopriv. Nauke*, 1953, **6** (13/14): 69-86, bibl. 46.

Processes involved in the production of plum juice are described in detail. The composition of fresh plums and of the juice during processing and after storage is given.

3538. van Haarlem, J. R.
**Canning quality in plums.**
*Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab., 1951-1952*, pp. 64-5, illus.

Four varieties of plum were canned at 5 stages of maturity and in 3 syrup strengths. From an examination of the canned plums after 2 months storage it would appear that the nearer to eating ripeness a variety is picked the better is the quality of the canned product, and, with coloured plums, the better the colour.

*Noted.*

3539.

a ALDERFER, R. B.
**The fertilization and liming of Pennsylvania fruit soils.**
*Bett. Crops*, 1954, **38** (4): 11-14, 42-4, illus.

b ANON.
Die Normen für Tafelobstgebinde des Schweizerischen Obstverbandes. (**Standards for dessert fruit containers in Switzerland.**)
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 261-2.

c AOMORI APPLE EXPERIMENT STATION.
***Annual Reports of the Aomori Apple Experiment Station for the years 1948, 1949 and 1951***, pp. 75, 68, and 83.
In Japanese.

d BARKER, B. T. P.
**Perry.**
*Agriculture, Lond.*, 1954, **61**: 164-7.
Including notes on perry pear varieties.

e (BINFIELD, R. E.)
**Fruitgrowing in Australia. Observations by New Zealand specialist.**
*Orchard. N.Z.*, 1954, **27** (5): 15-16.
Apples and pears in Tasmania and Victoria.

f CONGRÈS POMOLOGIQUE.
*Congrès pomologique de France, 1953, 84e Session, Rennes.* (**Pomological congress of France, 1953, 84th session, Rennes**), 1954, pp. 250.

g DEKKER, P.
Jonge fruitteelt in het Land van Waas. (**New fruit plantations in north Belgium.**)
*Cult. Hand.*, 1954, **20**: 339-42.
Apples, pears and strawberries.

h FISHER, D. V.
**Maturity of Bartlett pears for canning.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 30-2.

i KENT, W. G.
**Cherry growing in Kent.**
*Agriculture, Lond.*, 1954, **61**: 168-72.
Varieties and cultural methods.

j LEBLOND, C.
L'accélération de la maturation des poires. La maturation des poires à l'éthylène. (**Hastening the ripening of pears. Ripening pears with ethylene.**)
*Arbor. fruit.*, 1954, No. 3, pp. 3-5, bibl. 2.
Directions for the use of ethylene gas.

k MONZINI, A., AND CHIAPPARINI, G.
Tecnologia dei succhi di frutta. Nota I. Pastorizzazione e modificazioni biochimiche dei succhi. (**Fruit juice technology. Note I. Pasteurization and biochemical changes.**)
*Ann. Sper. agrar.*, 1954, **8**: 1073-82, bibl. 12.
Strawberry, grape, cherry, melon, apricot, fig, plum and peach.

l NITSCH, J. P.
Phytohormones et biologie fruitière. I. Les mécanismes hormonaux de la croissance des fruits. II. Biochimie des auxins. III. L'emploi des auxines dans la pratique agricole. (**Plant growth substances and fruit biology. I. The hormonal mechanisms of growth in fruits. II. The biochemistry of the auxins. III. The use of auxins in agriculture.**)
*Fruits d'Outre Mer*, 1953, **8**: 91-7, bibl. 8, illus., 533-43, bibl. 9, illus., 1954, 9: 157-62, bibl. 7, illus.
[See also *H.A.*, 23: 68.]

m (OSBORNE, A.)
**Fruitgrowing in South Africa. Federation manager presents some interesting sidelights.**
*Orchard. N.Z.*, 1954, **27** (5): 31-2.
Some acreages and varieties of top fruits.

n RAW, G. R.
**Pollination of fruit and other crops.**
*Bee World*, 1954, **35**: 177-9.
A review based on abstracts in *Bee World* from 1950 onwards.

o LE ROUX, J. C.
**A simplified method for contour orchard layout.**
*Fmg S. Afr.*, 1954, **29**: 221-3, 229, illus.
Using a bipod level.

p SEMB, G., AND LJONES, B.
En oversikt over analyseresultatene av 600 jordprøver fra frukthager. (**A survey of 600 soil analyses from Norwegian orchards.**)
*Gartneryrket*, 1954, **44**: 331-2.

q SPANGELO, L. P. S., AND PHILLIPS, W. R.
**A study of picking maturities and conditioning of certain pear varieties.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 36-8.
Enie, Miney, Patten, Phileson, and O-291 (Winter Nelis × Bartlett).

r SPANGELO, L. P. S., AND POAPST, P. A.
**An evaluation of the keeping quality of Bancroft and 0-2016 apples.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 78-9.

s STOUGHTON, R. H.
**Some aspects of growth and development in the fruit plant.**
*A.R. E. Malling Res. Stat. 1953*, 1954, A37: 51-9.
A review of physiological aspects.

t SUBBAYYA, J.
**The purpose and effects of mechanical tillage in the culture of orchard crops.**
*S. Indian Hort.*, 1954, **2**: 33-51, bibl. 82.
A review.

u WALKER, J. H.
**Forty years' work at East Malling.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 223-7, illus.
A review.

v WALKER, J. H.
**The experimental plantations at East Malling.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 189-99, maps.
Notes on plots and experiments in progress.

w ZIELINSKI, Q. B.
**Peach varieties for Oregon.**
*Stat. Bull. Ore. agric. Exp. Stat.* **541,** 1954, pp. 19.

x ZWINTZSCHER, M.
Über die Widerstandsfähigkeit von F'$_2$ Bastarden des Apfels gegenüber dem Schorferreger *Venturia inaequalis* (Cooke) Aderhold. **(On the scab resistance of F$_2$ apple crosses.)**
*Gartenbauwiss.*, 1954, **1***: 22-35, bibl. 25.

---

* New series. Vol. 18 was published in 1945.

## SMALL FRUITS, VINES AND NUTS.

### *Small fruits.*

(*See also* 3342, 3357, 3416, 3422, 3436, 3443h, 3458, 3539g, 3572a-c, i, n, q, r, 3574, 3768, 4453, 4475.)

3540. SCHUPPE, E.
*Beerenobst-Sortenbeschreibungen.* **(Descriptions of soft fruit varieties [in Germany].)**
Eugen Ulmer, Stuttgart (at present Ludwigsburg), 1954, 9½×6½ in., pp. 64, illus., DM. 2.40.

The brochure deals with varieties of raspberry, blackberry, red currant, black currant, gooseberry and strawberry officially recommended for cultivation in Western Germany. In each case detailed descriptions and illustrations, which should facilitate identification, are followed by a discussion of the special merits of the variety.

3541. SCHÖNTAG, A.
Über den Einfluss von Mineralsalzen auf den Zuckergehalt des Nektars. **(The influence of mineral salts on the sugar content of nectars.)**
*Z. vergl. Physiol.*, 1953, **35**: 519-26, from abstr. in *Bee World*, 1954, **35**, No. 182/54.

Manurial treatments with N, P and K had no effect on nectar secretion by individual flowers of black currant, gooseberry, raspberry, rape and lucerne. However, some of the plants responded to the addition of fertilizer by an increase in the total number of flowers developed. Among these, black currant plants receiving P, K and double N developed 32 times as many flowers as the controls.

3542. KUPPUSWAMI, B. S.
**A note on the vegetative propagation of Cape gooseberry (*Physalis peruviana* Linn.) by shoot cuttings.**
*S. Indian Hort.*, 1954, **2**: 25, bibl. 1.

Quality and yields vary widely between plants raised from seed. Experiments on propagation by shoot cuttings were made in 1950/51 with the ultimate aim of fixing desirable qualities and standardizing yields. Hormone-treated cuttings averaged 38% success compared with 24% in untreated ones. The best results were obtained in March/July whereas rooting was nil or poor in the cold months (November/January). Plants raised from cuttings flowered slightly earlier than seedlings and gave a slightly higher yield over 5 months, but were less vigorous.

3543. REEVE, R. M.
**Fruit histogenesis in *Rubus strigosus*. II. Endocarp tissue.**
*Amer. J. Bot.*, 1954, **41**: 173-81, bibl. 22, illus.

A description is given of the histogenesis of the sclereids forming the drupelet endocarp in raspberry. Other tissues associated with the endocarp are also described. [For Part I, see *H.A.*, 24: 2328.]

3544. GRUBB, N. H., AND WOOD, C. A.
**Recent progress in raspberry breeding.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 95-104, bibl. 12.

Recent progress in raspberry breeding at East Malling is reviewed, and the results are given of cropping trials of a number of varieties and seedlings at East Malling and in Scotland. Particulars are given of the families from which the more recent new varieties and seedlings have been raised, together with notes on some of the individual seedlings and their progeny. [Authors' summary.]

3545. RUXTON, J. P., AND MODLIBOWSKA, I.
**Preliminary studies on the resistance of raspberry varieties to spring frosts.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 111-17, bibl. 7.

Laboratory trials are described in which potted raspberry plants and cut racemes were subjected to temperatures of −2·0° and −3·0° C. Among several varieties tested none showed marked resistance, but some suffered less damage than others. The pot plant tests and raceme tests gave different responses in some cases, notably that of Norfolk Giant, which indicates that factors other than basic resistance are of importance. Open flowers and fruitlets were more subject to damage than were buds.

3546. MODLIBOWSKA, I., AND RUXTON, J. P.
**The effect of maleic hydrazide on the spring frost resistance of the Malling Exploit raspberry.**
*J. hort. Sci.*, 1954, **29**: 184-92, bibl. 12.

Malling Exploit raspberries were sprayed at "bud burst" with 750 p.p.m. maleic hydrazide, and subjected to low temperatures at "green bud" or "open flower" stages. The growth of many buds, especially those at an advanced stage when sprayed, was delayed by maleic hydrazide; some buds were killed by the treatment and secondary buds which replaced most of these did not compensate for the initial damage. Frost damage was increased where growth was strongly inhibited; some frost resistance was induced in buds not too strongly inhibited; the delay in flowering tended to reduce frost damage. The net effect of spraying with maleic hydrazide was a reduction in crop.—E. Malling Res. Stat.

3547. ARNEY, S. E.
**Studies of growth and development in the genus *Fragaria*. III. The growth of leaves and shoot.**
*Ann. bot. Lond.*, 1954, **18**: 349-65, bibl. 11.

Studies were made on changes in leaf size and in the number and size of the leaf cells of strawberry plants throughout the growing season and during drought and defoliation. The duration of the meristematic phase of primordium growth was the major factor affecting leaf size in all cases. A new index of shoot growth reflecting the rate of cell production was used, together with the leaf initiation rate, to distinguish changes in growth rate at the time of runner production and initiation rate. [For Parts I and II, see *H.A.*, 23: 2694 and 24: 212.]

3548. ROBERTSON, M., AND WOOD, C. A.
**Studies in the development of the strawberry. II. Stolon production by first-year plants in 1952.**
*J. hort. Sci.*, 1954, **29**: 231-4, bibl. 4, diagrams.

Runners of Sir Joseph Paxton, Royal Sovereign and Auchincruive Climax, planted near Dundee in spring, 1952, showed emerging stolons by the fourth week of May, by late April and by the third week of May respectively. Overwintered crowns produced stolons mainly in May and June, and spring-formed secondary crowns mainly from June to August. De-blossoming increased the production of primary stolons. Early-formed primary stolons produced the longest runner series. The origin and formation of stolons is briefly described. [Authors' summary.] [For Part I, see *H.A.*, 24: 2334.]—Scot. hort. Res. Inst., Mylnefield.

3549. SUGIYAMA, T., AND OTHERS.
**Ecological studies on strawberry varieties.**
[Japanese, with English summary ½ p.]
*Res. Rep. Japan Minist. Educ.* **17**, 1954, pp. 45-54, bibl. 14.

Strawberry varieties were grown in 3 different climates. Yields were greater in cooler climates. Varieties of the type producing few inflorescences and flowers gave low yields in the cool climate while those of the type producing numerous inflorescences and flowers yielded numerous small fruits in the warmer climate. Other characters studied were flower production, runner production, resistance to heat, drought and cold, and response to cultural systems.

3550. HABRAN, R.
Les variétés de fraisiers à gros fruits. **(Large-fruited strawberry varieties.)**
*Bull. hort. Liège*, 1954, **9**: 179-82, 208-13.

Detailed descriptions of strawberry varieties grown in Belgium include origin, synonyms, plant habit, characters of leaves, inflorescences, flowers, fruits and runners, and notes on periods of growth, fruit set and susceptibility to diseases and pests.

3551. v. SENGBUSCH, R.
Senga-Sengana—eine neue ertragreiche Erdbeersorte. **(Senga-Sengana—a new high-yielding strawberry variety.)**
*Gartenwelt*, 1954, **54**: 225, illus.

The characteristics of this new strawberry variety include high yield, the protection of its flowers by the foliage which increases their frost resistance, and its suitability for processing.

3552. KOBEL, F., AND SCHÜTZ, F.
Eine neue Erdbeersorte der Eidg. Versuchsanstalt Wädenswil. **(A new strawberry variety of the Wädenswil Research Station.)**
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 343-4, illus.

Wädenswil 5 is a high-yielding strawberry variety of good flavour, suitable for cultivation by amateurs. Its characteristics and its complicated pedigree are discussed.

3553. WILSON, D. J.
**Cultural experiments with strawberries.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 220-2.

Planting systems, irrigation and after-crop treatments for strawberries are discussed in the light of recent experiments. The matted-row planting system appears to have distinct advantages over the spaced or matted-bed systems, especially when soil moisture is adequate. In every one of 14 trials irrigation has increased yields. Several trials have shown that burning or cutting off and removing old leaves after cropping materially increase the succeeding crop as compared with the standard practice of removing straw and weeds and cutting off runners.

3554. CLARK, R. R.
**Here's how to increase yield from strawberry fields.**
*Bett. Fruit*, 1954, **48** (11): 10, 22, illus.

A survey of strawberry growers' practices in Oregon showed that factors increasing yields included irrigation, use of certified plants from one source, growing of one variety per farm or area, aphid control by dusting, use of narrow matted rows, shallow spring cultivation and good soil fertility.

3555. BOULD, C., AND CATLOW, E.
**Manurial experiments with fruit, I. The effect of long-term manurial treatments on soil fertility and on the growth, yield and leaf nutrient status of strawberry, var. Climax.**
*J. hort. Sci.*, 1954, **29**: 203-19, bibl. 6.

The effects of long-term manurial treatments, comparing F.Y.M., complete inorganics and omission of N, P and K respectively, on soil fertility, plant growth, yield of fruit, and leaf nutrient status of strawberry, variety Climax, are described. Manurial treatments had a significant effect on soil organic carbon, exchangeable K and acid-soluble $P_2O_5$. Significant effects were produced on plant vigour, and yield and quality of fruit. Omission of K had a serious deleterious effect on growth, yield and quality of fruit. Omission of N reduced growth and yield of fruit without affecting quality. Omission of P had no significant effect on growth, yield or quality of fruit. Complete artificials produced high yields and good quality fruit. Omission of K and N reduced the level of these two nutrients in the leaf below their threshold values and produced severe deficiency symptoms in the leaf. Omission of $P_2O_5$ reduced the P content of the leaf at certain stages but the level was sufficient to produce normal growth and high yields of fruit. The strawberry variety Climax appears to be able to obtain sufficient P for normal growth from a soil low in available $P_2O_5$. Plant growth and yield of fruit were related to the levels of N and K in the leaf at the time of flowering and fruiting. The results indicate the value of leaf analysis in manurial experiments with strawberry. [Authors' summary.]—Long Ashton Res. Stat., Bristol.

### *Vines.*

(*See also* 3572d, g, h, j-l, p, s, 4473, 4487.)

3556. Istituto Regionale della Vite e del Vino, Palermo.
Relazione del Presidente al Consiglio di Amministrazione per il 1° triennio di attività. **(First triennial report of the President to the Administrative Council.)**
(*Publ.*) *Ist. reg. Vite Vino*, 1954, pp. 26, illus.

The Regional Institute of the Vine and Wine at Palermo came into active existence in 1951. It serves Sicily and the neighbouring islands and its viticultural aims are an increase in the area of vineyards, the establishment and management of experimental vineyards, the control of disease, improved exploitation of the products of the industry and the advertising of these products. Mother vineyards of American vines and nurseries producing rooted cuttings are far from sufficient to supply Sicily's needs, and the Institute has established a vineyard and nursery at Villaverde to augment supplies from the government American Vine Nursery and the Consorzi Agrari. The Villaverde model farm consists of (1) experimental vineyards for studies on rootstocks for table and wine varieties, spacing, the effect of different types of cuttings on the yield and longevity of vineyards, grafting, training, manuring, and grape storage, and for the multiplication of good table and wine varieties; (2) a mother plant vineyard of French and Sicilian Berlandieri hybrids, especially those of Paulsen; (3) an irrigated area partly used as beds for rooting American vine cuttings. An experimental and demonstration vineyard has been established at Alcamo and a demonstration vineyard at Ispica.

3557. Mariman, G.
La viticulture septentrionale en plein air. **(Vine growing in the open in north Belgium.)**
*Courr. hort.*, 1954, **16**: 124-9, 182-90, 233-7, illus.

The year 1953 in several Belgian vineyards is surveyed, with reference to the behaviour of the grape varieties, their sugar content, and their resistance to frost and disease. Baco No. 1, an extra-vigorous hybrid, was resistant to all cryptogamic diseases. Subsequent sections deal with vine breeding and selection, vine varieties, powdery mildew and bird control, fruit decay and fermentation, rooting cuttings and rootstock culture. A short description of vine-growing in the Moselle and Ahr Valleys of Germany is given.

3558. Dragaš, M.
Prilog poznavanju sorata vinove loze na području zapadno-moravske i šumadisko-podunavske vinogradarske oblasti. **(A study of vine varieties in the western Moravian, Šumadian and Danubian vineyard districts.)** [English summary $\frac{1}{2}$ p.]
*Arh. poljopr. Nauke*, 1953, **6** (11): 97-112, bibl. 5.

Meteorological data for the areas are given together with notes on the distribution of varieties and rootstocks and on the age of vineyards. The sugar content of the must of Prokupac, the most popular variety in all districts, was high, producing a wine of high alcohol content.

3559. Golodriga, P. Ja.
**Selection of pollinating varieties of vine.** [Russian.]
*Agrobiologija*, 1953, No. 5, pp. 105-10, illus.

It is recommended that all vine varieties susceptible to malformation of berries and abnormal fall of flowers and of young berries [coulure?] should be artificially pollinated. Suitable pollinators for important varieties grown in the southern Crimea are given.

3560. Vaile, J. E.
**Concord grapes grafted on selected stocks yield more.**
*Ark. Fm Res.*, 1954, **3** (2): 3.

In trials at the Arkansas Agricultural Experiment Station Concord grapes grown on roots of other varieties and species produced considerably higher yields than those grown on their own roots. Among 10 rootstocks included in these tests, Cynthiana, Wine King, 41–B and 3309 have been outstanding in increasing yields and are now recommended to growers for further trial.

3561. Maingonnat, A.
Comportement et enracinement des principaux porte-greffes de vigne utilisés en Tunisie. **(Performance and rooting characters of the chief vine rootstocks used in Tunisia.)**
*Ann. Serv. bot. agron. Tunis*, 1951, **24**: 141-202, illus. [received 1954].

An account is given of the performance of the chief vine rootstocks in 8 different zones and on shallow or saline soils, and of their rooting characters, at the Colonial School of Agriculture. The twelve chief rootstocks are classified according to depth of rooting, vigour and adaptability to various soil types.

3562. Hengl, R.
Alte Erfahrungen und neue Erkenntnisse über das Veredeln von Weinreben mit Messer und Maschine. **(Old and new observations on hand and machine grafting of vines.)** [English, French and Spanish summaries.]
*Mitt. Klosterneuburg, Ser. A*, 1954, **4**: 149-65, bibl. 8, illus.

The development of vine grafting is reviewed with special reference to the histology of the tissues involved in the union and to the technique (mortise and tenon) and machine evolved by the author [see *H.A.*, 24: 225]. The histological and technical aspects discussed are well illustrated by drawings.

3563. Dragaš, M., and Avramov, L.
**The application of synthetic phytohormones in vine grafting.** [Serbian, with English summary 1 p.]
*Rev. Res. Work Fac. Agric. Belgrade,** 1953, **1** (1): 171-87, bibl. 9, illus.

In further trials [see *H.A.*, 23: 2725] on the use of growth substances in vine grafting the effects of 11 treatments on 3 scion-rootstock combinations were observed. Treatments of 2-3 seconds duration applied to the base of the grafts were found to be very satisfactory, increasing the percentage of rooting, number and weight of roots and shoot growth. Under the conditions of the experiment it was unnecessary to treat the stratified grafts at the place of union.

3564. Felber, G. W.
Stickstoffdüngung—Der Einfluss der zeitlichen Anwendung auf Traubenertrag, Mostqualität und Holzreife. (**The effect on yield, must quality and wood maturity of nitrogen applied at different periods.**)
*Weinberg u. Keller*, 1954, **1**: 212, from abstr. in *Mitt. Klosterneuburg, Ser. A*, 1954, **4**: 245.

In 3 years' trials carried out in the Rhine area vines received applications of nitrogen (1) in spring, (2) after flowering or (3) after cessation of growth (beginning of August). The highest yields were obtained from plots that received the total amount of N in August, and there were better results from application half in spring and half after flowering than from a single application in spring. Treatments (2) and (3), for which pure nitrates are recommended, also reduced coulure. No adverse effects on must quality and wood maturity were noted.

3565. Widhelm, H.
Wie steht es mit der Phosphorsäuredüngung in unseren Böden? (**Phosphatic manuring of vine soils [in Austria].**) [English, French and Spanish summaries.]
*Mitt. Klosterneuburg, Ser. A*, 1954, **4**: 166-83, bibl. 2.

A large-scale survey showed that most viticultural soils in Austria are deficient in P, and growers are encouraged to increase phosphate applications substantially.

3566. Peyer, E.
Wie kann in unserem Rebbau Sommerarbeit eingespart werden? III, IV. (**Saving summer labour in the vineyard. III, IV.**)†
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 227-31, 249-54, illus.

Economic pressure and shortage of manpower at peak periods make it essential that summer labour should be saved in Swiss vineyards. Growing the vines on a high trellis, as advocated by Moser [*H.A.*, 22: 231], would achieve this but the changes in technique involved would be radical. Experiments at Wädenswil, aiming at the adaptation of existing methods to modern needs, showed that summer pruning of vines grown on stakes may be reduced without detriment, provided the planting distance is increased to 120×130 cm., or on steep slopes to 110×130 cm. The customary summer treatment, it was found, stimulates shoot growth which in its turn makes further treatment necessary, while the growth of less severely pruned vines was not excessive. The conclusions so far reached are that light thinning coupled with the use of wire clips as a substitute for tying will effect considerable economies. Data are given on the labour requirements for various operations in the vineyard.

3567. C.S.I.R.O., Australia.
**Commonwealth Research Station (Murray Irrigation Areas), Merbein, Victoria.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 35-7.

*Horticulture:* In a trial on sultana cincturing, both the single- and the double-cut cincture affected yield and berry size, the single-cut cincture giving the smaller increase in berry size but the larger increase in fresh weight yield. In a sultana pruning trial, the second season's harvest showed a significant decrease from vines with the fewest but longest canes. Spraying currants with 2,4-D was superior to cincturing, the superiority becoming more marked with the years. Other work reported on sultanas includes green manuring, "shoot restriction disease" and fertilizers.

3568. Malan, H.
**Long-term storage of various grape varieties.**
*Dec. Fruit Gr*, 1954, **4**: 78-81, bibl. 3, illus.

Storage tests were made on Barlinka, Waltham Cross, Alphonse Lavallée, Red Emperor, Almeria, Hanepoot and Raisin Blanc grapes, in an atmosphere containing 20 p.p.m. of sulphur-dioxide gas, at 31° F. Barlinka, the most promising variety, was stored successfully for 6 months. Reducing the delay between picking and storage of Barlinka increased storage life; maturity, handling and packing methods also influenced the subsequent storage life. Alphonse Lavallée, Hanepoot and Raisin Blanc were not satisfactory for long-term storage; Almeria stored well for 4 months, but Red Emperor was susceptible to sulphur dioxide injury. [See also *H.A.*, 24: 2384.]

3569. Gac, A.
Influence de l'humidité relative et de la vitesse de circulation de l'air sur la conservation du raisin Muscat de Hambourg, en frigorifique. (**Effect of relative humidity and rate of air circulation on the cold-storage life of Muscat of Hamburg grapes.**)
*Fruits d'Outre Mer*, 1954, **9**: 163-7, bibl. 5.

Muscat of Hamburg grapes were stored for 28 days at 0° C. in R.H.s of 65, 80 and 98% with air circulating at 0·4 and 1·0 mm. per second (equivalent to 4 and 9 l./minute). The fruit stored well for the duration of the test at 80% R.H. at both rates of air flow. Detailed results are given.

### *Nuts.*

(*See also* 3572e, f, m, o.)

3570. Cambra, M.
Polinizaciones en almendro "Desmayo". (**Pollination trials with the Desmayo almond.**) [English summary 10 lines.]
*An. Estac. exp. Aula Dei*, 1954, **3**: 229-32, bibl. 5.

---

* Formerly *Yearb. Fac. Agric. Belgrade.*

† For reference to I and II see *H.A.*, 24: 2395q.

Four varieties, namely Comun, Amargo, De la P gruesa and Mollar de la Princesa, were found to be good pollinators for the virtually self-sterile Desmayo.

3571. Ščepotjev, F. L.
**Bisexual flowers of walnut.** [Russian.]
*Priroda*, 1954, **43** (3): 92-4, bibl. 3, illus.

Secondary flowering occurred on a frost-damaged 60-year-old walnut tree in the Kharkov region. In addition to the normal pistillate and staminate inflorescences, bisexual inflorescences were found on all branches. The nuts developing from these abnormal flowers were small and unsightly.

*Noted.*

3572.

a Black, C. J.
**Organisation of raspberry picking into chips and punnets.**
*Rural adv. Leafl. Edinb. Coll. Agric.* **31,** 1954, pp. 4.
For canning, quick-freezing or the fresh fruit market.

b Brooks, A. N.
**Florida Ninety strawberry after one year in commercial production.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 109-11.

c Christ, E. G.
**Small fruit varieties.**
*Ext. Bull. N.J. St. Univ.* **267,** 1954, pp. 12.

d Christ, E. G.
**Grape growing in New Jersey.**
*Ext. Bull. N.J. St. Univ.* **268,** 1954, pp. 11.
American or American × European hybrids.

e Cox, J. A., and Hanchey, R. H.
**Pecan propagation. Top-working pecan trees.**
*Ext. Publ. La Div. agric. Ext.* **1152,** revised 1953, pp. 16, illus.
By inlay-bark grafting and patch budding.

f Evreinoff, V.-A.
Les causes du rendement irrégulier du noisetier. **(Causes of irregular bearing in hazel.)**
Reprinted from *Ann. Éc. nat. sup. Agric., Toulouse*, 1954, **2**: 47-54, bibl. 10.
See *H.A.*, 24: 1288.

g Guillot, R.
Remarques sur l'orientation des plantations dans le centre-ouest. **(Trends in [vine] planting in west-central France.)**
*Progr. agric. vitic.*, 1954, **142**: 12-18.
The chief vinifera and hybrid direct producer varieties.

h König, F.
Der Weinbau in Steillagen. **(Vine growing on steep slopes.)** [English, French and Spanish summaries.]
*Mitt. Klosterneuburg, Ser. A*, 1954, **4**: 183-7.

i Ministry of Agriculture, London.
**Cultivation of raspberries.**
*Adv. Leafl. Minist. Agric. Lond.* **180,** revised 1954, pp. 5.

j Nègre, E.
Degré de maturation du raisin de table Chasselas. **(Degree of maturity for Chasselas table grapes.)**
Galzy, P., and Evesque, J. M.
À propos de la maturité des raisins de table. **(On maturity in table grapes.)**
*Progr. agric. vitic.*, 1954, **141**: 347-9, bibl. 4, and 349-58, bibl. 4.
The sugars: total acids ratio as a test of maturity for Chasselas, Alphonse de Lavallée and Aramon.

k Rebour, H.
Pour lutter contre l'érosion menaçante, plantons les vignobles suivant les courbes de niveau. **(Contour planting of vineyards to control soil erosion.)**
*Fruits et Prim.*, 1954, **24**: 60-3, illus.
In North Africa.

l Scholfield, B.
**Inventor solves problems in the vineyard.**
*Fruit World, Melbourne*, 1954, **55** (4): 21, illus.
Tractor-drawn implement for hoeing beneath vines.

m Serr, E. F., and others.
**The Davey almond.**
*Bull. Calif. agric. Exp. Stat.* **741,** 1954, pp. 8, illus.
A suitable pollinator for Nonpareil.

n Sharpe, R. H.
**Horticultural development of Florida blueberries.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 188-90, bibl. 7.
*Vaccinium ashei*, *V. myrsinites* and *V. darrowi.*

o Sosa-Bourdouil, C., and Sosa, A.
Recherches sur la composition du pollen de *Corylus avellana* L. **(Research on the [chemical] composition of the pollen of *Corylus avellana*.)**
*Bull. Soc. Chim. Biol.*, 1954, **36**: 393-403, from abstr. in *Bol. Inst. Invest. agron. Madrid*, 1954, **14**: 300-1.

p Steinmetz, H.
Neue Weinbaugeräte. **(New machines for the vineyard.)**
*Tech. Bauern Gartn., Ausg. A*, 1954, **6**: 236-7, illus.
For soil cultivation.

q Strauss, E.
Produktion, Marktverhältnisse und Preisverlauf bei Erdbeeren. **(Production, marketing and prices of strawberries [in Austria].)** [English, French and Spanish summaries.]
*Mitt. Klosterneuburg, Ser. B*, 1954, **4**: 115-22, bibl. 6.
Recommendations on soil management, packing and varieties.

r WASSENAAR, L. M.
Determinatietabel en beschrijving van een aantal aardbeirassen. **(Identification tables and descriptions of a number of strawberry varieties.)**
[*Publ.*] *Inst. Vered. Tuinbouwgew., Wageningen*, 1954, pp. 48, illus.

s WILLIAMS, B. L., CASTEEL, H. W., AND WENDER, S. H.
**Isoquercitrin and quercetin in Concord grapes.**
*Proc. Okla Acad. Sci. 1952*, 1954, **33**: 250-1, bibl. 1.
See also *H.A.*, 23: 356s.

## PLANT PROTECTION OF DECIDUOUS FRUITS.

### *General.*

(*See also* 4482, 4490, 4494 l.)

3573. FAO (LING, L.).
**Digest of plant quarantine regulations. First Supplement.**
[*Publ.*] *FAO, Rome*, 1954, pp. 100.

Summaries of plant quarantine legislation are given for 38 countries or territories not covered by the previous digest. The index refers also to the 40 countries covered by that digest.

3574. WINSOR, A. P.
**Higher yields from healthier stocks.**
*Agriculture, Lond.*, 1954, **61**: 232-6.

Notes are given on the effects of the crop (health) certification schemes successfully used in Great Britain for potatoes, strawberries, black currants, raspberries and fruit tree rootstocks.

3575. BAZÁN DE SEGURA, C.
Principales enfermedades de las plantas en el Peru. **(The commoner diseases of plants in Peru.)**
*Bol. Estac. exp. agric. La Molina* **51,** 1953, pp. 46.

Very brief notes are given on the control by fungicidal and cultural means of the principal diseases (named in Spanish and English) of numerous tree fruits, small fruits, vegetables and ornamentals. The common names, formulae and uses of some common fungicides are listed in an appendix.

3576. OSBURN, M. R., AND OTHERS.
**Insects and diseases of the pecan and their control.**
*Fmrs' Bull. U.S. Dep. Agric.* **1829,** revised 1954, pp. 56, illus.

This bulletin, which combines and supersedes 2 previous ones, includes descriptions of pecan pests and diseases and their control, with notes on spraying materials and methods, and a general spray schedule.

### *Disturbances of nutrition or of unknown origin.*

(*See also* 3333, 3389, 3390.)

3577. BOVAY, E., AND FAVRE, C.
Le dépérissement du pommier Reinette du Canada en Valais. I. Essais de fumures et diagnostic foliaire.
FAVRE, C., AND BOVAY, E.
Le dépérissement du pommier Reinette du Canada en Valais. II. Recherches agrologiques. **(Decline in the Reinette du Canada apple in Valais. I. Manurial tests and foliar analysis. II. Soil investigations.)**
*Rev. romande Agric. Vitic.*, 1954, **10**: 55-6, 63-4.

Part I. In Valais, Switzerland, in 1947 manurial trials were started on 20-year-old Reinette du Canada trees, which showed decline in their poor vegetative growth. From 1947 to 1953 each tree was given annually 7·8 kg. N, 6·7 kg. $P_2O_5$ and 15·3 kg. $K_2O$. A second trial was started in 1949 with 30-year-old Canada and Franc-Roseau apples. Although the influence of the fertilizers was slow to appear, by 1952 and 1953 trees in the first experiment were well developed and growing healthily, though the effect was not so marked in the second experiment. Foliar analysis showed a good nutritive balance in healthy trees. Trees with decline symptoms were deficient in nutrients, especially K, and N and P to a lesser extent; this may have been due to long drought periods when nutrient uptake by the roots was insufficient for top growth.

Part II. The soils in which the decline was noticeable were alluvial with great variation in profile, thus making root penetration difficult. The sub-soil was dry, poor physically and deficient in mineral nutrients. The authors conclude that the poor growth of the trees was due to lack of water and adequate nutrition, aggravated by several climatic factors.

3578. PEYER, E.
Frühe Herbstverfärbung bei den Reben. **(Early autumn colouring in vines.)**
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 346-8, bibl. 2, illus.

For several years it was observed that the foliage of many young vineyards in Switzerland assumed a deep red colour early in the season. Yields of affected vines were not reduced, but in extreme cases the quality of the grapes deteriorated. Potassium deficiency was ruled out as a source of the trouble, but the symptoms are very similar to those described by Wilhelm [*H.A.*, 24: 2546n] for magnesium deficiency of vines.

3579. DERMINE, A., AND MONIN, A.
Nouvelles observations sur la maladie du rougissement des feuilles de la variété de poiriers Durondeau. **(New observations on leaf reddening in the Durondeau pear.)**
*Fruit belge*, 1954, **22**: 97-101.

The symptoms of leaf reddening in Durondeau pears [see also *H.A.*, 23: 3970] appear first in May when tree growth is arrested and the leaves become chlorotic. Subsequently, either the leaves wilt and the tree dies, or about July some partial recovery is apparent in that the leaves become green again, although there is no further growth. In August the vegetative cycle apparently stops and the leaves colour prematurely; the fruits fall or remain small and highly coloured on the tree, taste unpleasant and keep badly. Although the disease may be caused by a virus, no positive result has as yet been obtained from transmission grafts. Investigations on the root systems of infected trees showed the presence of necrosis which appeared first in the young rootlets and then spread to the larger roots; browning affected the aerial parts of the rootstock and ascended into the scion. Trees which had recovered showed corky swellings over the necrotic spots. The authors conclude that the necrosis is a result of frost injury to quince rootstocks, and that scion influence on stock may account for varietal susceptibility. Manurial practice also appears to have some effect, as orchards receiving heavy manurial applications, especially of nitrogen, are more susceptible. It is also hoped to breed frost-resistant quince rootstocks. At present the trouble can be overcome to some extent by approach grafting affected trees on quince with an intermediate stock of a resistant variety, such as Doyenné du Comice.

3580. Gavrilović, M.
Apopleksija kajsija i mere za njeno otklanjanje. (**Apoplexy of apricot and methods of preventing it.**) [French summary 1 p.]
*Arh. poljopriv. Nauke*, 1953, **6** (13/14): 137-48, bibl. 8, illus.

Results of observations made in nurseries and orchards between 1949 and 1953 indicate that premature death of apricot trees is mainly due to the condition known as apoplexy, the causes of which are complex. Apoplexy was often found to occur as a result of freezing of the cambium at the base of the trunk. Incidence of frost damage was most frequent under conditions unfavourable for growth and of rootstock-scion incompatibility. The susceptibility of apricot to apoplexy was affected by physiological development, genetic and micro-ecological factors and rootstock. It was observed that apricots grafted at the height of the crown on the indigenous plums Belošljiva, Petrovača, Ilinjača and certain other varieties lived longer than those on other rootstocks. Dženerika [*Prunus cerasifera* var. *mirabolana*] was found to be an unsatisfactory rootstock and it is recommended for use only in conjunction with a suitable stem-builder.

3481. Fritzsche, R., and Vogel, W.
Einiges zur Bodenmüdigkeit im Obstbau. (**Soil sickness in orchards.**)
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 243-9, bibl. 2, illus.

Apple and St. Julien plum seedlings were pricked out into "sick" soil that had been treated either with trace elements or fumigants. Both treatments failed to improve the growth of the plants. In the following year, however, apple seedlings pricked out into pots of electrically sterilized soil developed normally. It appears that the soil fumigants either did not effect adequate sterilization or did not reach a sufficient depth. An examination of roots 1–2 mm. in diameter from "sick" soil stained by the lactophenol-cotton blue method, revealed the presence of numerous spherical structures—reminiscent of oospores of *Phytophthora*—in association with non-septate hyphae. Apple seedlings grown in sterilized soil that had been inoculated with small pieces of affected roots exhibited all the symptoms of soil sickness, while the controls remained healthy. Work on the isolation of the fungus is in progress. When the authors used other methods (described) in the study of rootlets growing in "sick" soil, they found many species of nematode, especially *Cephalobus nanus*, both attached to the roots and inside them. So far it has not been possible to determine whether a connexion exists between fungal and nematode infection, or whether both or only one of the pathogens cause the symptoms of soil sickness.—Wädenswil.

3582. Lundstedt, H.
Behandlingsförsök mot jordtrotthet i fruktodling. (**The control of soil sickness in orchards.**)
*Fruktodlaren*, 1954, No. 2, pp. 52-5, illus.

Young trees of the apple variety Ingrid Marie on M.XIII were planted on land that had carried apples for 40 years. The following four soil treatments were compared: (1) formaldehyde, (2) a tar preparation, (3) DD and (4) the replacement of the soil around the tree (1·5 m.$^2$ to a depth of 30 cm.) by a similar, fresh soil. After 5 years the increase in stem diameter recorded 20 cm. above the union was 32, 26, 28 and 34 mm. for (1), (2), (3) and (4) respectively, as compared with 20 mm. for the untreated controls. The trial is being continued, though with a smaller number of trees.—Ekerum Res. Stat., Öland.

3583. Parmentier, G., and Detroux, L.
Au sujet de nécroses des limbes de la vigne causées par le chlorate de soude. (**Vine leaf blade necroses due to sodium chlorate.**)
*Parasitica*, 1954, **10**: 97-8, illus.

Herbicides used on neighbouring roadsides were suspected of causing leaf blade necrosis in vines under glass. Pot experiments in which soil applications of sodium chlorate were made confirmed this, similar symptoms resulting.

3584. Padfield, C. A. S., and Woon, P.
**Calyx-end breakdown: an unusual form of breakdown in Sturmer Pippin apples.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 75-7, bibl. 2, illus.

A physiological flesh breakdown, which has been recorded sporadically since 1925, caused losses of up to 29% in cool-stored Sturmer Pippin apples in the Hastings district in 1953. The symptoms of the disorder are described, and the name calyx-end breakdown is suggested to distinguish it from other forms of breakdown. A survey of orchards failed to reveal any common factor that might have caused the trouble and no means of controlling it is known.

3585. Nyhlén, Å.
Pricksjuka. Iakttagelser vid 1953-54 års lagringsförsök med äpple. (**Bitter-pit. Apple storage trials 1953/54.**)
*Fruktodlaren*, 1954, No. 3, pp. 82-3.

Observations show that apples from young trees (9 years) are more liable to develop bitter pit than those from 15- and 27-year-old trees. Late applications of nitrogen appeared to favour the trouble.—Swedish Fruit Storage Cttee.

### *Climatic factors.*

(*See also* 3689i, w, 3690x.)

3586. Becker-Dillingen, H.
Die Widerstandskraft von Obst und Gemüse gegen niedrige Temperaturen. (**The resistance of fruit and vegetables to low temperatures.**)
*Schweiz. Gärtnerztg*, 1954, **57** (18): 1-2, bibl. 1.

Data taken from Rose, Wright and Bratley: Freezing injury of fruits and vegetables, *Circ. U.S. Dep. Agric.* 713, 1944, are discussed with regard to critical time of exposure and typical symptoms shown in banana, pineapple, certain deciduous fruits and vegetables.

3587. MORETTINI, A.
I danni delle basse temperature del decorso inverno su alcune varietà di pesco. (**Winter damage in some peach varieties in the winter of 1953/54.**) [English summary 9 lines.]
*Riv. Ortoflorofruttic. ital.*, 1954, **38**: 161-75, bibl. 6, illus.

In 1954 abnormally low winter temperatures caused bud damage to peaches at Voghera and elsewhere in northern Italy. The peach varieties in the orchards of the National Research Council (C.N.R.) at Voghera were classified according to their frost hardiness. Guidobono and Lorenzino were very resistant with 90–100% undamaged buds. Examples of varieties with very low resistance, showing only 10 to 25% normal buds, were J. H. Hale, Trionfo and Amsden.

3588. NIELSEN, J. P., BENEDICT, H. M., AND HOLLOMAN, A. J.
**Fluorescence as a means of identifying smog markings on plants.**
*Science*, 1954, **120**: 182-3, bibl. 7.

Investigations on vegetables and ornamentals showed that in addition to the commonly recognized smog markings there are others that cannot readily be distinguished by eye from markings caused by other factors such as insects, poor cultural practice, and flooding. It was found that the smog markings can be differentiated by the fact that they fluoresce distinctively under ultraviolet irradiation.—Stanford Res. Inst., Stanford, Cal.

### *Viruses.*

(*See also* 3689c, l, n, o, s, 3690 l, q, u, v.)

3589. POSNETTE, A. F., AND CROPLEY, R.
**Distribution of rubbery wood virus in apple varieties and rootstocks.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 150-3, bibl. 4.

A method of indexing apple trees for rubbery wood virus is described. Over 90% of the Lord Lambourne indicators, when grafted with infected material, developed symptoms in the year of inoculation, or in the year following when budded. Two years may be required, however, for the diagnosis of mild strains of the virus. Different degrees of rubberiness can be caused by virus variation. The relative positions of the index and indicator buds on the rootstock were found to be important. They should be placed on the same side of the stock, though they need not be exactly aligned. A test of M.I and M.IX stoolbeds on the Research Station showed 80% to be infected. Some infected stools of M.IV and Crab C were also found. No virus was detected in the new Malling–Merton series or in nine rootstocks of the M.IX crosses tested. Virus-tested sub-clones of the Malling series are now being multiplied rapidly for general use. A test of a large number of apple varieties growing on the Station showed many to be infected with rubbery wood virus; there is evidence that it had been distributed by propagation rather than by spread from tree to tree in the orchards. [Authors' summary.]

3590. ATKINSON, J. D., CHAMBERLAIN, E. E., AND HUNTER, J. A.
**Apple ring spot.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **35**: 478-82, bibl. 2, illus.

Ring-spot, an unrecorded disease of apples, has been known in New Zealand for 18 years. Symptoms, found only on fruits, appear as patches of russeted tissue edged with a smooth, dark brown band, and occasionally as partial or complete concentric brown rings. The disease is widespread in the variety Granny Smith, but loss is not serious. Grafting experiments have shown that the symptoms are perpetuated in infected scions, and suggest that the disease is slowly transmitted to healthy trees; it may be caused by a virus. [From authors' summary.]

3591. LUŠIN, V., PANJAN, M., AND REGAN-MASTNAK, A.
Kemijske metode za odredivanje virusnih bolesti koštićavog voća. (**Chemical tests for stone fruit virus diseases.**) [English summary ½ p.]
*Zasht. Bilja*, 1954, No. 22, pp. 6-17, bibl. 23.

When 4 chemical methods used in the U.S.A. (Lindner, Kirkpatrick and Weeks) for diagnosing virus diseases in stone fruits were tested, samples from the same leaf gave differing results. The methods were least satisfactory for testing *Prunus* virus 7, where positive reactions were obtained with samples showing no disease symptoms.

3592. STANČEVIĆ, A., AND PAVIĆEVIĆ, B.
Intensitet napada šarke na razne sorte šljiva u rejonu Toplice. (**The intensity of *Prunus* virus 7 [plum pox] infection on different plum varieties in the region of Toplica.**) [English summary 1¼ pp.]
*Zasht. Bilja*, 1954, No. 22, pp. 38-46, bibl. 7, illus.

In a detailed investigation of plum orchards in the region of Toplica all varieties were found to be infected with *Prunus* virus 7. The varieties grown are grouped according to the degree of infection observed and the organs of the tree affected.

3593. COCHRAN, L. C., AND STOUT, G. L.
**Apricot ring pox.**
*Bull. Calif. Dep. Agric.*, 1953, **42**: 7-10, bibl. 4, illus.

The symptoms of this virus—well illustrated here in colour—occur on the fruit, leaves and current season twig bark as irregular chlorotic spots and rings. The only control is by removal of diseased trees, although this measure is complicated by the occurrence of symptomless carrier varieties, such as Royal.

3594. CHAMBERLAIN, E. E., ATKINSON, J. D., AND HUNTER, J. A.
**Moorpark-mottle; a virus disease of apricots in New Zealand.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **35**: 471-7, bibl. 1, illus.

A new virus found on Moorpark apricot trees in

Central Otago, New Zealand, has been tentatively named moorpark-mottle. The foliage symptoms are scattered chlorotic areas, more pronounced on the upper leaf surface, which become conspicuous in late December and early January. Fruits from infected trees are misshapen, with depressions on either side near the stem cavity; these symptoms appear about mid-January and increase with maturity. The virus was experimentally transmitted by budding to Moorpark and seedling apricots, Paragon and seedling peaches, and to cherry plum.

3595. Wagnon, H. K., and Breece, J. R.
**Necrotic leaf spot of peach and its effect on June-budded nursery stock.**
*Bull. Calif. Dep. Agric.*, 1954, **43**: 13-17, bibl. 4, illus.

Necrotic leaf spot is known to occur only on peach and nectarine, the symptoms being seen on young unfolding leaves as brown or purple areas which later drop out of the leaves. The disease has little effect on mature trees, but can be of economic importance with June-budded seedling peach trees in the nursery. Transmission is by budding and grafting, and there is no evidence of natural spread. Sweet cherry is a symptomless carrier of this virus.

3596. Hildebrand, E. M.
**Yellow-red or X-disease of peach.**
*Mem. Cornell agric. Exp. Stat.* **323**, 1953, pp. 54, bibl. 60, illus.

A report is given of investigations carried out between 1938 and 1944 on eastern X-disease, or yellow-red virosis, a virus disease of peach. The report includes a description of symptoms with emphasis on symptom expression indoors, the results of host range studies, modes of transmission and tests comparing X-disease with other peach viruses. The virus was inactivated by immersing budsticks in water at 50° C. for 6 to 7 minutes. Natural inoculation takes place between 15 June and 15 July, and the best control is the eradication of the natural host, chokecherry [*P. virginiana*]. [See also *H.A.*, 14: 1123.]

3597. Wolfe, H. R., and Anthon, E. W.
**Transmission of the western X-disease virus from sweet and sour cherry to peach by two species of leafhoppers.**
*J. econ. Ent.*, 1953, **46**: 1090-2, bibl. 4.

Experiments are described demonstrating the first transmission of the western X-disease virus, as it occurs in Washington, from diseased sweet and sour cherries to healthy peach by the leafhoppers *Colladonus geminatus* and *Scaphytopius acutus.*

3598. Nielson, M. W., and Jones, L. S.
**Insect transmission of western-X-little-cherry virus.**
*Phytopathology*, 1954, **44**: 218-19, bibl. 4, illus.

Leafhoppers, *Colladonus geminatus*, were allowed to feed on sweet and sour cherry trees infected with western-X-little-cherry virus for 37 to 46 days; the insects were then transferred to healthy test trees of Montmorency cherry on mahaleb, where they were allowed to feed for 116 to 126 days. Symptoms of western-X-little-cherry disease appeared about 1 year later when approximately 35% transmission was shown.

3599. Gilmer, R. M., Moore, J. D., and Keitt, G. W.
**X-disease virus: I. Host range and pathogenesis in chokecherry.**
*Phytopathology*, 1954, **44**: 180-5, bibl. 8, illus.

The host range and pathogenesis of the X-disease virus in chokecherry (*Prunus virginiana*) were studied in field and greenhouse. Three strains were separated on the basis of different symptom induction in chokecherry. The virus was found in aerial and underground parts during the growing season, but only in aerial parts when the chokecherry was dormant. The disease was readily transmissible from dormant buds of diseased trees after 35 days storage at 34° to 36° F., but movement of the virus within the chokecherry was slow. The virus was transmitted to a number of *Prunus* species.—Bureau of Plant Industry, U.S.D.A., and Univ. Wisconsin, Madison.

3600. Posnette, A. F., and Cropley, R.
**Field studies on virus diseases of strawberries. II. Seasonal periods of virus spread.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 154-7, bibl. 7.

By exposing successive batches of *Fragaria vesca* plants to virus infection in an unsprayed strawberry plot, it was found that the two main periods of virus spread were during May and June, when viruses 1 and 2 (mild crinkle and yellow-edge) were spread, and during the autumn, when infection was mainly of virus 2. There was close relationship between the number of aphids (*Pentatrichopus fragaefolii*) on the permanent plants in the plot, the number of *F. vesca* plants that became infested with aphids and the number of *F. vesca* plants that were infected with virus in each exposure period. There was little virus spread to plants that were guarded from wingless aphids by sticky collars, but it is thought that these collars may have afforded some protection also from winged aphids. The autumn period of virus spread is considered important in the propagation of strawberry plants. [Authors' summary.]

3601. Bovey, R.
La chaleur, moyen de lutte contre les maladies à virus des plantes. **(Heat, a method of control for plant virus diseases.)**
*Rev. romande Agric. Vitic.*, 1954, **10**: 65, bibl. 12.

A method is described for the control of virus in strawberry plants which is used at the Agricultural Research Station, Lausanne. Well-rooted 2-year-old plants give the best results. Most of the leaves are removed and the plants are placed in a thermostatically controlled oven in which the temperature is kept at 37° C. for 10 days. The number of plants surviving this treatment varies as the result of fungal activity, and complete destruction of the virus is not achieved in all the surviving plants. The proportion of cured plants obtained from the 2 most successful batches treated was 50% and 37·5%, but the average percentage cure obtained from all tests made in 1953 was only 5·4. This low rate of success makes the method unsuitable for commercial use at present, but it is of considerable value for obtaining virus-free clones of varieties such as Madame Moutot which are 100% infected.

### *Bacteria.*

(*See also* 3689p.)

3602. Crosse, J. E.
**Bacterial canker, leaf spot, and shoot wilt of cherry and plum.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 202-7, illus.

In Britain *Pseudomonas mors-prunorum* is responsible for most of the bacterial diseases of cherry and plum, but *P. prunicola* may occasionally cause similar damage, especially on cherries. The latter is thought to be identical to, or a special form of, *P. syringae*, a major pathogen of stone fruits in the U.S.A. The author describes the winter and summer phases of the disease, modes of infection and transmission, the effects of environment, varietal susceptibility, and control in relation to horticultural practices and by spraying with bordeaux mixture.

3603. McKeen, W. E.
**An anatomical study of cane and crown galls.**
*Canad. J. Bot.*, 1954, **32**: 527-30, bibl. 5, illus.

An anatomical study was made of galls which occur naturally on the stems of boysenberry and Himalaya blackberry plants. The galls form at any region of the stem of the floral canes of plants systemically infected with *Agrobacterium rubi* and originate from or near the cambial layer, and not from the outer layer of the pericycle. The vascular system in galls caused by *A. rubi* and *A. tumefaciens* on broad bean, tomato, sugar beet, loganberry, and Himalaya blackberry plants is connected to the vascular system of the organ on which they are growing. [Author's abstract.]

### *Fungi.*

(*See also* 3539x, 3689f, 3690c, j.)

3604. Allen, P. J.
**Physiological aspects of fungus diseases of plants.**
*Annu. Rev. Plant Physiol.*, 1954, **5**: 225-48, bibl. 150.

This review is concerned with the inception and results of diseases of higher plants caused by fungi that are obligate parasites, with particular reference to the diseases caused by rusts (Uredinales) and powdery mildews (Erysiphaceae) and including downy mildews (Peronosporaceae). The literature is considered under 3 headings: the inception of the disease, the environmental factors affecting the host's suitability as a substrate for development of the parasite, and the changes in host physiology resulting from infection. The author concludes that, although the main problems concerning rust and mildew parasitism remain unsolved, their study will benefit greatly from a rigid control of the genotype of both host and parasite.

3605. Wilkinson, E. H.
**Fungal rots of apples with special reference to *Gloeosporium* spp.**
*Ann. appl. Biol.*, 1954, **41**: 354-8, bibl. 17.

*Gloeosporium album* and *G. perennans* are the main, but not the only, fungal species giving rise to lenticel rots in apples. The first signs appear in November and early December as brown or purple discolorations of the lenticular tissue; these spots rapidly expand until they appear as circular rots, and finally white spore-bearing acervuli break through the skin. Counts indicate that dessert varieties and "king" apples are more susceptible than culinary varieties and "lateral" apples. In the orchard both species appear as bark cankers, and trees become infected in the summer, particularly through new pruning cuts. From a study of isolates from infected tissues of Allington Pippin, it is suggested that physiological breakdown of the lenticels occurs before fungal rotting develops. Recently the prevalence of fungal rotting has increased, which may be due in part to larger numbers of fruit being stored for longer periods.

3606. (Rijkstuinbouwconsulentschap Maastricht.)
Fruittelers let nu op stambasisrot (*Phytophthora cactorum*). (**Fruitgrowers—take notice of apple collar rot.**)
*Fruitteelt*, 1954, **44**: 658, illus.

Cox's Orange Pippin infected with *Phytophthora cactorum* had the infected bark cut out in the autumn of 1953, and the wounds smeared with 4% bordeaux; in April 1954 another bordeaux treatment was given. An examination of the trees on 10 July showed no further infection, but 5 days later the symptoms re-appeared, their sudden appearance being probably due to the wet weather. The disease, however, had not spread throughout the bark, and brown colouration was only visible here and there, thus indicating that swift treatment could reduce loss.

3607. Jacks, H., and Brook, P. J.
**Control of black spot of apples.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 78-89, bibl. 1.

Three seasons' experiments in control of black spot [scab (*Venturia inaequalis*)] of apples are described. Fungicides containing ferbam or thiram applied over the whole season gave control equal to that obtained with "standard" programmes of bordeaux mixture and sulphur. On Delicious, Dougherty, Dunn's Favourite, Granny Smith, Jonathan and Parlin's Beauty applications of phenyl mercury chloride did not cause excessive damage and gave control of black spot equal to standard programmes, but with Sturmer in Hastings (though not in Auckland), Cox's Orange and Crimson Cox, damage to trees was severe. Phenyl mercury triethanol ammonium lactate and captan were not widely tested but showed promise. Four other fungicides, wettable sulphur, colloidal copper, a glyoxalidine complex and dichloro naphthoquinone, were unsatisfactory. Owing to possible occurrence of mercury residues on fruit, phenyl mercury chloride should be replaced after mid-December applications by less toxic fungicides. [Authors' summary.]

3608. Loewel, E. L.
Orthocid 50, ein neues Fungizid. (**Orthocide 50, a new fungicide.**)
*Mitt. ObstbVersuchsringes Jork*, 1954, **9**: 179-81, bibl. 7.

In preliminary trials Orthocide 50 (captan) gave very encouraging results against apple scab.

3609. Statens Forsøgsvirksomhed i Plantekultur.
Fortsatte undersøgelser over aebleskurvens modningstid. (**Further studies on ascus maturity in *Venturia inaequalis*.**)
*Erhvervsfrugtavl.*, 1954, **20**: 168-70.

Observations have shown that in Denmark the asci of *Venturia inaequalis* reach maturity when apple trees are in the "green bud" or "mouse ear" stage. Data on ascus development on old leaves and on the discharge of spores are tabulated.

3610. Statens Forsøgsvirksomhed i Plantekultur.
Betydningen af sprøjtetidspunkternes beliggenhed i forhold til infektionsperioderne ved bekaempelse af aebleskurv. (**The timing of sprays for the control of apple scab in relation to the period of infection.**)
*Erhvervsfrugtavl.*, 1954, **20**: 239-4.

The same number of treatments were timed to coincide (1) with certain developmental stages of the tree and (2) with the periods of ascospore discharge. In two years' trials spraying according to ascospore discharge proved the more effective against apple scab, the timing by rainfall in early summer being sufficiently accurate. There was no difference in results between sulphur and mercury sprays.

3611. Rojecka, N.
*Entomosporium maculatum* Lέw na dziczkach grusz. (**Leaf blight on pear rootstocks.**)
*Roczn. Nauk rol., Ser. A*, 1953, **67** (4): 129-30.

*Entomosporium maculatum*, the conidial form of *Fabraea maculata*, can be effectively controlled by repeated applications of copper sprays.

3612. Wormald, H.
**The brown rot diseases of fruit trees.**
*Tech. Bull. Minist. Agric. Lond.* **3**, 1954, pp. 113, bibl. 934, illus., 5s.

Brown rot in all its many forms of *Sclerotinia* and *Monilia* should certainly be a proud organism judging from the care bestowed on it by the experts, not to mention the maledictions of the orchardists. In 1934 Dr. Wormald had already been examining its habits and depredations for some 20 years when the Ministry published his first bulletin on the subject [see *H.A.*, 5: 325]. Since then hundreds more scientists have joined the fray and have added to our knowledge of this still hearty enemy of cultivated fruit trees. The author deals with their contributions under the following headings: history, geographical distribution, losses due to brown rot, classification and nomenclature of brown rot and related fungi, morphology and cytology, conditions conducive to infection, mode of entry, culture physiology and biochemistry of the brown rot fungi, antagonism and antibiotic effects in relation to brown rot fungi, laboratory methods and toxicity tests, fungicides in relation to their use for control of brown rot, host plants, and control: general principles. To the grower doubtless those parts which deal with the incidence and the control of brown rot in individual fruit species will be of the greatest interest. Whether they will give him much pleasure is, however, another matter.

3613. Byrde, R. J. W.
**Experiments on the control of brown rot of apples and plums. IV. A supplementary note on winter spraying.**
*J. hort. Sci.*, 1954, **29**: 226-30, bibl. 4.

Winter application of 0·7% pentachlorophenol, formulated in 3·5% tar-oil emulsion, to Laxton's Superb apples was followed by a significant reduction in the infection of wounds by brown rot (*Sclerotinia fructigena*) during August. Subsequently, the rapid build-up of the disease offset the effects of the eradicant fungicidal treatment. [Author's summary.]—Long Ashton Res. Stat., Bristol.

3614. McGlasson, W. B.
**The effect of ultra-violet irradiation on the development of brown rot in stone fruits after harvest.**
*J. Aust. Inst. agric. Sci.*, 1954, **20**: 48.

Significant reductions in brown rot occurred when apricot fruits inoculated with *Sclerotinia fructicola* were exposed some hours later to ultra-violet light. An exposure of 15 minutes was adequate; longer exposures caused some damage to the fruit.

3615. Smith, W. L., Jr., McClure, T. T., and Haller, M. H.
**Post-harvest treatments for the reduction of peach decays.**
From abstr. in *Phytopathology*, 1954, **44**: 390.

Fungicidal, fumigant and sulphur dusting treatments were applied. Nine different fungicides reduced *Monilinia fructicola* decay by 44–74%, the most effective being Isothan Q 15 (74%) and captan (73%). Only Dowicide A and rimocidin were effective against *Rhizopus nigricans* decay; they reduced it by 38% and 62% respectively. Fumigation with tetrachloroethylene and trichloroethylene reduced *Rhizopus* but not *Monilinia* decay. Sulphur dusting followed by tetrachloroethylene fumigation at 75° F. reduced both decays. Sulphur dusting reduced *Monilinia* decay to the same extent whether the peaches were held continuously at 75° F., or at 40° F. for 4 days and then at 75° F. [See also *H.A.*, 24: 294.]

3616. Govi, G., and Tassinari, M. M.
*Phytophthora megasperma* Drech., agente di marciume radicale del pesco. (***Phytophthora megasperma*, agent of a root rot in peach.**) [English summary 4 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 1187-96, bibl. 23, illus.

An account is given of a peach root rot due to *Phytophthora megasperma* which appeared in the Romagna district in 1950 and rapidly kills affected trees. The incidence of the disease varies greatly from year to year and appears to be higher in wet years.—Ist. Pat. veg., Univ. Bologna.

3617. Yarwood, C. E.
**Apricot powdery mildew from rose and peach.**
*Bull. Calif. Dep. Agric.*, 1952, **41**: 19-25, bibl. 13, illus.

All recent cases of apricot fruit infected with powdery mildew (*Sphaerotheca pannosa*) have been associated with mildewed roses, particularly *Rosa banksiae*.

3618. FISHER, E. E., AND JENKINS, P. T.
**Spray trials for control of apricot "freckle".**
*J. Dep. Agric. Vict.*, 1954, **52**: 265-7, 270, illus.

Apricot "freckle", caused by *Cladosporium carpophilum*, can cause severe losses in southern districts of Victoria. Investigations over 3 seasons have shown that the disease can be controlled by a spray schedule of bordeaux mixture 6: 6: 40 at the pink-bud stage, and 0·12% thiram or ziram with 1% white oil at shuck fall, and 7 to 8 weeks after shuck fall.

3619. WILKINSON, E. H.
**Grey mould in strawberries.**
*Comm. Gr*, 1954, No. 3052, pp. 1390-1.

Royal Sovereign strawberries, strains M.40 and M.48, at Wye College were severely attacked by *Botrytis cinerea* in June 1953. Examination indicated that infection occurred mainly either from dead petals or from contact with straw; undamaged fruits touching the soil remained free from attack. By 18 June the estimated loss was 40%. Slipping rubber bands over the leaves to keep them upright proved ineffective. Recourse was then had to picking all the diseased berries by hand, and further diseased berries were removed during later picking operations. From 1 acre of Sovereigns between 1⅔ and 2½ tons of diseased fruit were removed at a cost of £50. This expense was, however, justified by a subsequent crop of 2½ tons valued at £365. The epidemic nature of this outbreak is discussed in relation to meteorological data recorded during the period.

3620. HEY, G. L., AND HUNNAM, D.
**Controlling botrytis on strawberries.**
*Comm. Gr*, 1954, No. 3053, p. 20.

Good commercial control of botrytis on strawberries was obtained by the use of a dusting powder containing 10% captan. In trials in Cheddar with Bradley Cross the dust was applied 4 times from the end of May at weekly intervals, at a rate of 30 lb./acre. At the first count in mid-June infected fruit was reduced from 25% to 5%, at the second count 2 days later from 44% to 9%. On Deutsch Evern, which was dusted twice with the same powder, infection was reduced from 56% to 17%.

3621. STURGESS, O. W.
**A strawberry ripe fruit rot.**
*Qd agric. J.*, 1954, **78**: 269-70, illus.

A new strawberry disease in S.E. Queensland caused nearly 50% ripe fruit wastage in some plantings in 1952. Ripe fruits show dark brown depressions, which remain firm and finally become mummified. Leaf and flower stalks show black longitudinal lesions. The causal organism is *Gloeosporium* sp., and optimal infectivity takes place at temperatures of 75° to 85° F., which occur in mid-spring to early summer. Recommended control is the removal of all infected fruit.

3622. PAYEN, B., THELLOT, B., AND THIOLLIÈRE, J.
Mise en évidence d'une synergie entre le zinèbe et les produits cupriques dans la lutte contre le mildiou de la vigne. **(Evidence of a synergistic action between zineb and copper compounds in the control of vine mildew.)**
*C.R. Acad. Agric. Fr.*, 1954, **40**: 317-20.

Laboratory tests were made on the rate of inhibition of conidia of downy mildew (*Plasmopara viticola*) by 3 spray compounds, (*a*) containing 60% zineb, (*b*) containing 50% copper and (*c*) a mixture containing 37·5% Cu and 15% zineb. Results showed that the same lethal efficiency was shown by the mixture (*c*) at much smaller quantities of each of the components than by either of the components alone. Experiments in the field were made on 2-year-old Gamay Beaujolais plants using the same spray formulae, at varying rates, and also bordeaux mixture, all sprays being applied 8 times between 27 May and 12 August. Results taken in September and October showed satisfactory protection against mildew by all sprays on 1 September, but subsequently only the largest, viz. 0·4%, dose of the Cu-zineb mixture gave satisfactory control. By the end of October defoliation was almost nil on plants sprayed with the Cu-zineb mixtures, while the plants sprayed with Cu alone showed 10% to 25% defoliation, and those sprayed with zineb 80% defoliation.

3623. BOUBALS, D., AND VERGNES, A.
Essais de fongicides organiques dans la lutte contre le mildiou de la vigne effectués en 1953. **(Tests with organic fungicides against vine downy mildew in 1953.)**
*Progr. agric. vitic.*, 1954, **141**: 330-5, **142**: 6-12, bibl. 4.

The first experiment was concerned only with the residual effect of the 2 proprietary fungicides used. Both N-trichloromethylthiotetrahydrophthalimide (S) and zinc ethylene 2-dithiocarbamate (D) were markedly non-persistent. In S the duration of residual effect was not, and in D it was, proportional to the concentration. It was concluded that when S or D is used the final treatment should still consist of 2% bordeaux mixture, which should be applied at about 1,000 l. per ha. in the case of a moderately vigorous variety in the south of France. In the second experiment the effect of the 3 products on the growth and physiology of a young Carignan vine on 99 R was studied. No significant effects were observed apart from the delay in the autumn colouring of the foliage caused by the bordeaux. [For the results of the 1952 tests at the INRA viticultural laboratory see *H.A.*, 23: 2834.]

3624. CORDONNIER, R.
Étude, du point de vue oenologique, des fongicides organiques de synthèse à base d'éthylène-bis-dithiocarbamate de zinc et de N-trichlorométhyl-thio-tétra-hydrophtalimide employés dans le traitement du mildiou de la vigne. **(The effect on wine of zinc ethylene bis-dithiocarbamate and N-trichloromethylthio-tetrahydrophthalimide fungicides used in the control of vine downy mildew.)**
*C.R. Acad. Agric. Fr.*, 1954, **40**: 243-6, bibl. 7.

The dithiocarbamate used had no effect on the progress of fermentation or the flavour of the wine when added to the must or to the harvested grapes. The phthalimide had a very marked inhibitory effect on fermentation in similar circumstances, but spray residues had no effect provided the last treatment took place not later than 2 months before the harvest. The use of phthalimide products for the late treatment of vines is not recommended.

3625. Wilhelm, A. F.
Über die fungizide Wirkung des Schwefels bei der Oidiumbekämpfung. **(The fungicidal action of sulphur on powdery mildew of vine.)**
*Weinberg u. Keller*, 1954, **1**: 124-9, from abstr. in *Mitt. Klosterneuburg, Ser. A*, 1954, **4**: 245-6.

The author showed that the fungicidal action of sulphur on powdery mildew of vine is not due to the formation of $SO_2$ but to the vaporization of elemental sulphur occurring at a temperature of about 20° C. In that state sulphur molecules will penetrate into the protoplasm of the fungus where they are reduced to $H_2S$. The relation between fungicidal action and temperature is discussed.

### *Mites.*

(*See also* 3689b, u, v, 3690m, p.)

3626. Lienk, S. E., and Chapman, P. J.
**Evaluation of acaricides on orchard mites in 1952.**
*J. econ. Ent.*, 1953, **46**: 1085-6, bibl. 2.

Notes and some tabulated results are given of trials on the control of European red mite, *Metatetranychus ulmi*, and two-spotted spider mite, *Tetranychus bimaculatus*, on apples in New York.

3627. Haynes, H. L., and others.
**A butoxypolypropylene glycol to control the European red mite on apples.**
*J. econ. Ent.*, 1953, **46**: 1020-5, bibl. 4.

In preliminary greenhouse tests butoxypolypropylene glycol, approximate molecular weight 800, and its formulations with the sodium salt of 5,11-diethyl pentadecyl-8-sulphate gave good control of greenhouse red spider mite species on a wide range of plants. During 2 years' field trials against European red mite, *Paratetranychus pilosus*, on apples this compound at 1·5 lb. per 100 gal. was as good as or better than a dinitro compound at 20 oz., but was somewhat less effective than parathion at 4 oz. With heavy infestations, 2–3 applications of each material were necessary. Butoxypolypropylene glycol caused no visible injury to apple fruit or foliage and is of particular value because of its very low toxicity to mammals.—N.J. agric. Exp. Stat.

3628. Kirby, A. H. M., Tew, R. P., and Gambrill, R. G.
**The fruit tree red spider mite, *Metatetranychus ulmi* (Koch): pilot trials in the field of some new ovicides active against winter eggs.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 171-4, bibl. 6.

Field trials of new chemicals, based on laboratory studies, for the control of the winter egg of the fruit tree red spider mite have been carried out on a small plot of trees of Worcester Pearmain. The results indicate that "delayed dormant" application of dinoseb as an amine salt are not likely to afford greater control than the standard DNC-petroleum washes. In attempts to improve the performance of dinoseb, the addition of an efficient wetting agent increased control, while a polyethylene polysulphide preparation offered somewhat greater promise as a sticker than did calcium caseinate. Three chlorinated phenyl benzenesulphonates were found to give excellent control with one early (green cluster) application; applied twice (green cluster plus pink bud or pink bud plus petal-fall) at a lower concentration, one ester gave excellent results, although some damage was caused by the post-blossom application. [Authors' summary.]

3629. Collyer, E.
**Some predacious insects of commercial orchards.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 218-19, illus.

Brief descriptions are given of 5 predators of the fruit tree red spider mite [*Metatetranychus ulmi*] that are most commonly found in sprayed orchards in Britain, and the effect of common spraying materials on these predators is discussed.

3630. Rich, S.
**Miticidal action of barium and manganese ethylene bisdithiocarbamates.**
*Phytopathology*, 1954, **44**: 387, bibl. 6.

Tests at the Connecticut Agricultural Experiment Station, New Haven, in 1953 showed that both barium and manganese ethylene bisdithiocarbamate were effective acaricides, while the former was an excellent foliage protectant against apple scab.

### *Insects.*

(*See also* 3335, 3689a, e, g, h, k, r, z, 3690a, b, g, w.)

3631. Garman, P., and Townsend, J. F.
**Control of apple insects.**
*Bull. Conn. agric. Exp. Stat.* **552,** 1952, pp. 84, bibl. numerous, illus.

This loose leaf, quarto size, booklet deals with the insect and mite pests of apple occurring in Connecticut, under the following headings: damage, life history, factors affecting abundance, predators and parasites, and control. In addition there are numerous illustrations and diagrams, spray programmes and notes on chemicals.

3632. Madsen, H. F., Borden, A. D., and Koch, E. C.
**Two major pests on apples.**
*Calif. Agric.*, 1954, **8** (6): 14-15, illus.

Apples grown in California for processing must be kept free from insect infestation before harvest. Control of a late season build-up of red spider was obtained by acaricidal sprays applied on 1 July and 6 August; control of woolly aphid was obtained to some extent by the inclusion of an aphicide in the mite treatment.

3633. Garman, P., Brigham, W. T., and DeCaprio, A.
**Control of peach insects.**
*Bull. Conn. agric. Exp. Stat.* **575,** 1953, pp. 64, bibls. extensive, illus.

Sixteen pests of peach in Connecticut are dealt with under the headings: description, damage, life history, factors affecting abundance, predators and parasites, control measures, references to literature. At the end of the bulletin are notes on minor insect pests, a spray chart, notes on spray materials (chlorinated hydrocarbons and organic phosphates) and a subject index.

3634. Green, H. B.
**Peach insect control with low-gallonage spray in Mississippi.**
*J. econ. Ent.*, 1954, **47**: 354-5.

Brief notes showing that low-volume applications gave better control of plum curculio [*Conotrachelus nenuphar*] and oriental fruit moth [*Cydia molesta*] than regular sprays.

3635. Savzdarg, V. E.
**Tiophos against *Dentatus communis* Mordv. on apple.** [Russian.]
*Sad i Ogorod*, 1954, No. 4, p. 75.

The grey or gall apple aphis *Dentatus communis* [=*Anuraphis communis*=*A. devecta?*] appears to be on the increase in some fruitgrowing areas of the U.S.S.R. For its control DDT was found to be unsatisfactory, but one treatment with a 0·1% solution of 30% NIUIF–100 (tiophos), applied early in the spring when the larvae emerge from the overwintering eggs, resulted in 100% mortality. The spray did not cause any visible injury to the apple foliage, nor did it retard growth.

3636. Stace-Smith, R.
**Chlorotic spotting of black raspberry induced by the feeding of *Amphorophora rubitoxica* Knowlton.**
Knowlton, G. F.
**A new black raspberry aphid.**
*Canad. Ent.*, 1954, **86**: 232-5, illus., and 235-6.

Investigation has shown that a chlorotic spotting of the leaves of black raspberry (*Rubus occidentalis*) is due to the feeding of a newly identified toxiferous aphid, *Amphorophora rubitoxica*. The new species, which is described in the second paper, failed to transmit two raspberry viruses readily transmitted by the closely related *A. rubi*.

3637. Michelbacher, A. E., and Davis, C.
**Walnut aphid investigations.**
*Calif. Agric.*, 1954, **8** (7): 4.

Investigations on the control of walnut aphid [*Cromaphis juglandicola*] with systemic insecticides have shown that both demeton and OMPA will give excellent control, although some leaf injury was noticed on trees sprayed with more than ¾ lb. of demeton per acre. Fairly high aphid populations, up to 50 aphids per leaflet before codling moth spray, had little adverse effect upon the harvested nuts; large infestations late in the season apparently also caused little harm. A control programme once started must be continued efficiently, or the aphid population will build up in the absence of their natural enemies. The discovery of a strain of aphid resistant to parathion [see *H.A.*, 24: 2493 and next abstract] has caused recommendations to be made for the use of alternate materials in the spray programme, e.g. parathion for the first spray, and nicotine for the second. Two or three treatments should give satisfactory control for an entire season, and recommended materials and quantities are listed.

3638. Michelbacher, A. E., and others.
**Walnut aphid resistant to parathion in northern California.**
*J. econ. Ent.*, 1954, **47**: 366-7.

A strain of walnut aphid, *Chromaphis juglandicola*, on walnut, exhibiting definite resistance to parathion, was controlled by 14% nicotine dry concentrate at 9 lb. in 100 gallons of water.

3639. Orlando, A., Menezes Mariconi, F. A., and Iba, S.
"O besóuro de Limeira." Praga de plantas frutíferas, eucaliptos e algumas outras culturas. (**The Limeira beetle, a pest of fruit trees, eucalypts and some other crops.**) [English summary 8 lines.]
*Biológico*, 1954, **20**: 1-10, bibl. 3, illus.

The beetle, *Colaspis quattuordecimcostata*, previously of minor importance, caused serious damage to fruit tree and other crops in the Limeira and Piracicaba districts of the State of São Paulo, Brazil, in 1953, attacking fruit and foliage. The chief fruit crops affected were vine, some varieties of avocado, apple, plum, castor bean and mango. In control experiments the most effective dusts were methyl parathion [E.605], DDT, BHC and lindane. Lindane was the most effective spray. Detailed recommendations for control by dusting and spraying are made.

3640. Lozovoĭ, D. J.
**Control of *Cerambyx dux* Fald on stone fruits.** [Russian.]
*Sad i Ogorod*, 1954, No. 6, p. 79.

Two thorough treatments (in May and June) of the trunk and all branches with a 5% mineral oil emulsion of DDT gave very good control of *Cerambyx dux* on almonds and cherry plums.

3641. Tashiro, H., and Gambrell, F. L.
**Control of the European chafer on deciduous nursery stock *in situ*.**
*J. econ. Ent.*, 1953, **46**: 956-60, bibl. 2.

To prevent the spread of *Amphimallon majalis* during removal of large [unspecified] trees with a ball of soil from untreated nursery plantings, methods of surface fumigation were tested in New York. In the autumn of 1951 an ethylene dibromide-chlordane mixture applied with a watering-can at the rate of 40 ml. per gal. per sq, yard 5 days before digging gave 100% control of third-instar larvae when the temperature was above 50° F. In the autumn of 1952 a 20 ml. treatment gave almost as good results as the 40 ml. treatment, but spring applications tested during the same year were found to be less satisfactory. The treatment did not produce any visible symptoms of phytotoxicity.

3642. Costantino, G.
Stato attuale della lotta contro la mosca della frutta (*Ceratitis capitata* Wied.). Risultati di esperimenti compiuti in Calabria negli anni 1952-53. (**Present position in the control of the fruit fly, *Ceratitis capitata*. Results of experiments in Calabria in 1952 and 1953.**) [English summary 13 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 1283-1322, bibl. 58.

DDT, BHC, chlordane and phosphoric esters were compared for the control of *Ceratitis capitata* on peaches and citrus. The best results were given by a 0·5% suspension of 50% DDT wettable powder with a sticker at 0·2% or a wetter at 0·05% applied three times at 3-weekly intervals. Good results were also obtained with DDT emulsion plus parathion emulsion, and with parathion plus summer oil. Costs were largely covered by the extra yield.—Osserv. reg. Fitopat. Calabria, Catanzaro.

3643. Shedley, D. G.
**New insecticides and fruit fly control.**
*J. Agric. W. Aust.*, 1954, **3**: 355-8, bibl. 1, illus.

Poisoned sugar syrup baits containing various insecticides were compared for the control of Mediterranean fruit fly (*Ceratitis capitata*). Sodium fluosilicate was superior to BHC in the bait, when used in a field experiment. Baits using chlordane, aldrin and dieldrin were no more effective or rapid in action than the sodium fluosilicate bait, when used at comparable concentrations. In soil fumigation experiments against the larvae 1¼ lb. of gamma BHC per acre gave reasonable control, but DDT and chlordane gave disappointing results.

3644. Pitcher, R. S.
**The host plant range and economic importance of a group of gall midges (*Thomasiniana* spp.) associated with fruit.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 168-70, bibl. 7.

A comparison is made of all the members of the genus *Thomasiniana* Strand at present known from rosaceous host plants, namely *T. oculiperda* (Rübs.), the red bud borer; *T. theobaldi* Barnes, the raspberry cane midge; *T. crataegi*, the hawthorn stem midge, and a hitherto undescribed species from wild blackberry. Although morphologically very similar, each can be readily distinguished in host plant preference trials. By this means it has also been shown that there are two strains favouring apple and rose respectively, within the present species *T. oculiperda.* The biology and economic status of each species or strain is discussed. [Author's summary.]

3645. López Cristóbal, U.
Un parasito cecidogeno del manzano, "*Dasyneura* (*Perrisia*) *mali*" Kieffer. (***Dasyneura mali*, a cecidomyid apple pest.)**
*Rev. Fac. agron. Eva Perón*, 1953, **29**: 201-5, bibl. 6, illus.

First identified in Argentina in 1948 the midge has spread rapidly along the River Plate and causes up to 75% defoliation. Delicious is the principal variety attacked. Lead arsenate and DDT applied against codling moth have controlled the midge effectively.

3646. Müller, W., and Hahn, E.
Ist eine Bekämpfung des Goldafters im Jahre 1954 nur im Obstbau notwendig? **(Is it possible to confine control measures against the brown-tail moth to orchards in 1954?)**
*NachrBl. dtsch. PflSchDienst, Berlin*, 1954, **8**: 93-6, bibl. 7, illus.

The distribution of *Euproctis chrysorrhoea* in Eastern Germany is discussed, where the infestation of fruit trees by this pest has assumed serious proportions since 1949. Control measures in orchards should be supplemented by the spraying of forests.—Biolog. Zentralanst. Potsdam.

3647. Thiem, E.
Die Spätwinterspritzung, ein Verfahren zur Bekämpfung der Goldafter- und Eichenprozessionspinnerraupen. **(The control of *Euproctis chrysorrhoea* and *Thaumatopea processionea* larvae by a late winter treatment.)**
*NachrBl. dtsch. PflSchDienst, Berlin*, 1954, **8**: 90-3, bibl. 10.

The brown-tail moth (*Euproctis chrysorrhoea*) has become a serious fruit pest in several areas of Central Europe. A late-winter application of a DDT–BHC emulsion at a relatively high concentration (Duplinol 3%) gave good results against the larvae in their winter nests.—Biolog. Zentralanst., Berlin-Kleinmachnow.

3648. MacCreary, D.
**Evaluation of trunk sprays against peach tree borers in Delaware.**
*J. econ. Ent.*, 1954, **47**: 359-60, bibl. 2.

DDT, BHC, parathion, EPN-300 and dieldrin with the addition of a sticker applied to the trunk of peach trees three times during the summer gave commercial control of the peach tree borer, *Sanninoidea exitiosa.* A thorough treatment of all bark lesions with an oil-paradichlorobenzene mixture practically eliminated the lesser peach tree borer, *Synanthedon pictipes.*

3649. Madsen, H. F., and Borden, A. D.
**Codling moth and orange tortrix control on apricots in California, 1948-1953.**
*J. econ. Ent.*, 1954, **47**: 161-5, bibl. 5, illus.

Prior to 1950 the spray programme recommended for the control of codling moth [*Cydia pomonella*] on apricots consisted of DDT or TDE at petal fall followed by methoxychlor or parathion in May. Since 1950 codling moth populations have declined, and orange tortrix [*Argyrotaenia citrana*] has become the major pest. For control, TDE at petal fall and parathion in May were the preferred materials. Careful timing of the May treatment would control both pests. In 1953 trials, malathion was as effective as parathion against orange tortrix.

3650. Brunson, M. H., and Allen, H. W.
**Joint use of parasites and insecticides for control of the oriental fruit moth.**
*J. econ. Ent.*, 1954, **47**: 147-52, bibl. 3.

Mass liberations of *Macrocentrus ancylivorus* were made against the first 2 broods of oriental fruit moth, *Grapholitha molesta*, on peach trees in New Jersey. The parasite liberations were followed by 1 or 2 pre-harvest spray applications of DDT, parathion, EPN and metacide at normal concentrations. The joint use of parasites and 1 insecticide treatment over 5 years of the experiment gave a reduction of injury on ripe peaches about equal to that obtained by 2 pre-harvest sprays without parasites. The costs of the 2 methods of control are also thought to be about equal.

3651. BARNES, M. M., GAMMON, C., AND ROBINSON, D. W.
**Insecticide dusts for control of the Western grape leaf skeletonizer in California.**
*J. econ. Ent.*, 1954, **47**: 54-7, bibl. 4.

Results of a 3-years' trial indicate that for general control of *Harrisina brillians* on vine, 50% cryolite would appear to be superior to 5% or 10% DDT, since it results in very good ultimate mortality and good residual action, and would be less likely to interfere with potential biological control. Where many mature larvae were present, however, DDT was found to be more satisfactory. Among other dusts used, methoxychlor and TDE showed promise.

3652. NAEF, J.
Rhombenspannerschäden in Graubünden. **(Damage by the rhomboid looper in Graubünden [Switzerland].)**
*Schweiz. Z. Obst- u. Weinb.*, 1954, **63**: 298-9, illus.

Much damage was caused this spring to vines by *Boarmia rhomboidaria*; the looper eats out young buds so that the shoot cannot develop further. It can be controlled by DDT, parathion or diazinon preparations.

3653. FISCHER, M.
Untersuchungen über den Kleinen Holzbohrer (*Xyleborinus saxeseni* Ratz.). **(Studies on the small shot-hole borer.)** [English summary 1½ pp.]
*PflSch. Ber. Wien*, 1954, **12**: 137-80, bibl. 21.

This extensive study of the small shot-hole borer includes some observations on its control and on the symptoms of its presence on fruit trees. Carbon disulphide introduced into the galleries by means of a cotton plug was found to kill *Xyleborinus dispar* and *X. saxeseni* instantaneously, while synthetic insecticides applied by the same method or as sprays failed to give satisfactory results.

3654. DE TOLEDO, A. A.
Eficiência do DDT no contrôle da broca da figueira (*Azochis gripusalis*). **(Efficiency of DDT for control of the fig borer, *Azochis gripusalis*.)**
*Biológico*, 1954, **20**: 47-9, bibl. 1.

DDT and lindane at 2 concentrations in 1: 1 bordeaux mixture were compared for control of *Azochis gripusalis* in experiments in 1952/53. 50% DDT at 0·2% was the best. Applied fortnightly from late September to late February it gave 100% clean fruit compared with 57% in the control. [See also *H.A.*, 23: 2910.]

3655. STĘPNIEWSKA, K.
Owocnica jabłkowa (*Hoplocampa testudinea*). **(The apple sawfly, *H. testudinea*.)**
*Roczn. Nauk rol., Ser. A*, 1953, **67** (4): 125-7.

The biology of the sawfly in Poland is described, and its control by the destruction of fallen apples and by spraying with 3% quassia or a combination of arsenate and bordeaux mixture 3–6 days after petal fall is recommended.

3656. GORJAČEVA, E. P., AND BELJAKOVA, M. B.
**Means of controlling the apple sawfly.** [Russian.]
*Sad i Ogorod*, 1954, No. 5, pp. 78-9.

Experiments were conducted on the control of apple sawfly [*Hoplocampa testudinea*] in the Leningrad area. Best results were obtained when BHC dust was applied to the soil at 150 g. per tree prior to blossoming before the insects appeared and again during June drop when the caterpillars entered the soil.

3657. TURNIPSEED, G. F., AND SMITH, C. F.
**Life history and control of scales on apples in North Carolina.**
*J. econ. Ent.*, 1953, **46**: 969-72.

Experimental results presented show that Forbes scale (*Aspidiotus forbesi*), oystershell scale (*Lepidosaphes ulmi*) and scurfy scale (*Chionaspis furfura*) attacking apples can be effectively controlled by dormant oil sprays and/or parathion cover sprays.

3658. BATINICA, J., AND ČOLIĆ, M.
Gradacija smokvinog medića u Hercegovini. **(Heavy infestations of *Ceroplastes rusci* on figs in Hercegovina.)** [English summary ½ p.]
*Zasht. Bilja*, 1954, No. 22, pp. 18-23, bibl. 6, illus.

During the winter of 1952/53 spray applications of 6% Kreozan (DNOC) gave complete control of *Ceroplastes rusci* without damaging the fig trees.

3659. BARNES, M. M., FLOCK, R. A., AND GARMUS, R. D.
**Resistance to DDT by the grape leafhopper *Erythroneura variabilis* Beamer.**
*J. econ. Ent.*, 1954, **47**: 238-42, bibl. 3, illus.

Grape leafhoppers from vineyards receiving heavy, intermediate and no DDT treatment were found in laboratory tests to be very resistant to DDT, partially resistant and susceptible respectively. Three compounds which have been shown to activate DDT against resistant house flies failed to activate it against the very resistant strains of leafhopper. A fourth compound proved to be too toxic to the leafhoppers for use in DDT activation studies.

3660. LOZZIA, G.
Essais de traitement contre divers orthoptères à l'aide d'aldrine et de dieldrine. **(Tests on the control of certain orthopterous insects with aldrin and dieldrin.)**
*Terre maroc.*, 1954, **28**: 134-7.

Experiments were made in the Onjda district of Morocco in 1953 on the control of *Decticus albifrons*, *Calliptamus* spp., *Oedaleus* spp. and *Dociostaurus maroccanus* which attack orchards, vineyards and market gardens in the dry season. Effective control was obtained with dieldrin in orchards by spraying the soil and trees, and the trees alone, and by broadcasting treated bran; and with an aldrin-dieldrin spray applied to soil and trees. Dieldrin had a longer residual effect than aldrin.

3661. GERHARDT, P. D., AND LINDGREN, D. L.
**Penetration of various packaging films by common stored-product insects.**
*J. econ. Ent.*, 1954, **47**: 282-7, bibl. 1, illus.

Two experiments are described in which the penetrating ability of 11 species of insects through 14 different films enclosing walnut meats was tested. In both trials non-transparent laminated films containing aluminium foil as one of the laminae were the most resistant to insect penetration.

### *Other pests.*

(*See also* 3444a, 3689j.)

3662. Wegenaar, C.
Vogelafweer bij de kersenoogst. (**Scaring birds from the cherry harvest.**)
*Fruitteelt*, 1954, **44**: 654, illus.

In an attempt to reduce starling damage in cherry orchards, experiments were made in 1954 by the Instituut voor Tuinbouwtechniek, Wageningen, using an imitation sparrow-hawk. A 15 m. high iron mast was erected in a 2 ha. cherry orchard: a side-arm was attached to the top which revolved round the mast driven by a small electric motor: the imitation bird was attached to the side-arm by a nylon cord so that it "flew" over the trees. 1 ha. of the orchard was kept free from starlings, at a comparatively low cost.

3663. Morrison, A. E.
**The meadow mouse (*Microtus californicus*) problem in Sacramento county.**
*Bull. Calif. Dep. Agric.*, 1953, **42**: 59-62.

Meadow mice sometimes cause bark damage to fruit trees. Control has been obtained by toxaphene sprayed by aeroplane using a concentration of 2 quarts of 70% material in 10 gal. water.

### *Antibiotics and entomophagous organisms.*

(*See also* 3783, 3784, 3819, 3937, 4483.)

3664. Dye, D. W., and Dye, M. H.
**Effectiveness of therapeutants including antibiotics in preventing development of blast of stone fruit (*Pseudomonas syringae* van Hall).**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 21-6, bibl. 9.

Tests have been carried out to determine the effect of therapeutants, including antibiotics, in preventing infection of seedling peach trees by *Pseudomonas syringae* under glasshouse conditions. Compounds were applied as foliage sprays before plants were inoculated. Streptomycin sulphate and dihydrostreptomycin sulphate were the most effective compounds in preventing development of the disease. Streptomycin gave significant control at all concentrations from 1,000 μg./ml. to 50 μg./ml. Dihydrostreptomycin significantly reduced the number of lesions at concentrations from 1,000 μg./ml. to 100 μg./ml. When plants were sprayed with streptomycin and dihydrostreptomycin at a concentration of 100 μg./ml., lesions developed at 18·3% of the inoculation points, as compared with 88·3% on check plants. Aureomycin, terramycin and chloromycetin significantly reduced the number of lesions at high concentrations, but were not as effective as streptomycin or dihydrostreptomycin. No other compound was effective. Chloromycetin, polymyxin, thiolutin, bordeaux mixture, copper 8-quinolinolate and Murfixtan were phytotoxic at some concentrations. No phytotoxic effects were observed with any other compound. [Authors' summary.]

3665. Dye, M. H.
***In vitro* studies of the effect of antibiotics on *Pseudomonas syringae*.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 27-31, bibl. 17.

The inhibitory effect of 7 antibiotics on a strain of *Pseudomonas syringae* pathogenic to peach seedlings has been studied *in vitro*. Aureomycin, streptomycin, dihydrostreptomycin, terramycin and polymyxin all inhibited the growth of the test organism within the range 0·1 μg./ml. to 4·6 μg/ml. after 24 hours incubation. Aureomycin was the most effective compound, while chloromycetin and thiolutin were the least effective compounds. [From author's summary.]

3666. Ribaldi, M.
Osservazioni preliminari sull'attività antibiotica di *Camarosporium* sp. (**Preliminary notes on antibiotic activity in *Camarosporium* sp.**) [English summary ¾ p.]
*Ann. Sper. agrar.*, 1954, **8**: 1043-53, bibl. 7, illus.

An unidentified species of saprophytic *Camarosporium* commonly isolated from olive trees near Perugia shows antibiotic activity against a number of plant pathogenic fungi and human pathogenic bacteria. This is claimed to be the first instance recorded of antibiotic properties in a fungus of the order Sphaeropsidales.

3667. Toumanoff, C., and Grison, P.
Études préliminaires sur l'utilisation des bactéries et champignons entomophages contre les insectes nuisibles. (**Preliminary studies on the use of entomophagous bacteria and fungi against harmful insects.**)
*C.R. Acad. Agric. Fr.*, 1954, **40**: 277-80, bibl. 11.

Following laboratory tests with bacteria and fungi against injurious caterpillars, small-scale field tests were made. The fungus *Beauvaria densa*, sprayed as a biologic liquid onto caterpillars of *Hyponomeuta* spp. on apple trees, gave 58% mortality. A *Bacillus cereus* liquid sprayed on *Pieris* caterpillar on cabbage frequently gave 100% mortality, especially between 16° and 32° C.

### *Fungicides and insecticides.*

(*See also* 3689d, m, q, t, x, y, 3690d-f, k, n, o, r-t, y, 4261.)

3668. Martin, H.
**Guide to the chemicals used in crop protection.**
[*Publ.*] *Canada Dep. Agric.*, Ottawa. 2nd edition, 1953, pp. 295, $1.

The second edition of this useful publication gives information on the synonyms, history, manufacture, physical, chemical and biological properties, formulation and sometimes analysis of *ca.* 220 chemicals. It is on loose sheets into which revised and supplementary sheets can be inserted as required. [It is a remarkably good dollar's worth.]

3669. Garman, P., Keirstead, L. G., and Mathis, W. T.
**Quality of apples as affected by sprays.**
*Bull. Conn. agric. Exp. Stat.* **576**, 1953, pp. 46, bibl. 48, illus.

The effect was studied of several spray materials on the chemical composition, physical appearance and flavour of McIntosh, Baldwin, Gravenstein, Cortland and Delicious apples. From the results obtained the following conclusions were drawn. There was no significant effect of insecticides on sugars, but a slight trend towards an increase in sugars from non-arsenicals was apparent; some fungicides, notably Crag 341, greatly increased sugars. Arsenical sprays appeared to depress the total acidity slightly although this varied from year to year; some fungicides, for example a phygon-lead arsenate schedule, reduced the acid content, others, for example lead arsenate-captan or lead arsenate-Crag 341, gave no indication of depression. No differences in ascorbic acid content could be detected resulting from spray treatments. Minerals were depressed by arsenical sprays. Both insecticides and fungicides could affect the physical appearance of apples by russeting, sun scald, colour reduction and bleaching. Some spray combinations reduced yield, while others containing N may have increased it. Lead arsenate consistently affected the flavour unfavourably in Baldwin and Gravenstein, and to a lesser extent in McIntosh; significant taste preferences were shown for thiram-sprayed fruit over sulphur-sprayed fruit, but there was an indication that the best commercial grades may not be top quality from the flavour standpoint. Notes are also given on the effects of individual spray materials on quality.

3670. Tunis, W. D., Sudds, R. H., and Garman, P.
**"General-purpose" fruit spray mix tests—1953.**
*Progr. Rep. Storrs agric. Exp. Stat.* **6,** 1954, pp. 7.

Experiments in Connecticut were designed to study the efficiency of 3 general purpose spray mixtures for the control of apple pests and diseases by home growers. The formulae for the mixtures were: A-mix containing 30% sulphur, 10% DDT, 10% methoxychlor, 7·6% ferbam, 2·25% aramite and the remainder inert; B-mix containing 30% captan as 50% wettable powder, 20% malathion as 25% wettable powder, 30% methoxychlor as 50% wettable powder and 20% talc; C-mix containing 20% dilan as 50% wettable powder, 20% malathion as 25% wettable powder, 15% thiram, 10% soybean flour and 35% talc. These mixtures were diluted at 10 lb. per 100 gal. water and applied in 3 spray schedules, involving 6 or more applications, to 18-year-old McIntosh and Cortland trees. Results showed that both B and C were better than A, the main improvements being reduction in the amount of sun scald, better apple scab control, and improved fruit colour. B gave a better scab control than C, but total good fruit after spraying showed little difference between the 2 mixtures. The minimum schedule, namely 6 sprays, was the weakest, and this allowed a late season development of 2-spotted mites. B mixture was considered to be the best, and further tests on all 3 mixtures will be made in 1954. Tolerance tests were also made on grapes, blueberries, plums, nectarines, peaches, pears and quinces, and no fruit injury was noticed from mixtures B and C; fruit and leaf injury on pear, blueberry and grape was noticed with mixture A.

3671. Alfaro, A., and Vicente, S.
Pequeños ensayos con fungicidas. **(Small-scale tests of [new] fungicides.)**
*Bol. Inst. Invest. agron. Madrid*, 1954, **14**: 163-77, bibl. 7, illus.

Notes are given on trials on the control of vine white rot (*Coniothyrium diplodiella*), vine downy mildew (*Plasmopara viticola*) and apple and pear scab with sodium and zinc ethylene bisdithiocarbamate, N-trichloromethylthiotetrahydrophthalimide [captan], wettable sulphur and cuprous oxide.

3672. Ciferri, R.
L'impiego dell'etilenbisditiocarbamato di zinco per trattamenti a secco. **(The use of zinc ethylenebisdithiocarbamate as a dust.)**
*Not. Mal. Piante*, 1954, **27**: 7-14, bibl. 8.

Applied to the racemes during flowering and 4 times subsequently at intervals of 10–14 days dithane Z-78 gave effective protection against vine downy mildew, but dithane plus sulphur gave almost equal control more economically. The coefficients of infection were 1·32 and 3·83–5·40 respectively compared with 14·31 with sulphur alone. A single dusting of gladiolus corms previously infected with *Fusarium oxysporum gladioli* and *Penicillium gladioli* gave good protection against these pathogens, the infection rate being 13% compared with 70% in the control. Dithane dust applied to the ends of cuttings gave better control of basal rot (*Pythium* spp.) of geranium than zinc oxide, the indexes of infection being 0·25 and 1·75% respectively compared with 3·83 in the control; it significantly stimulated rooting.

3673. Harrison, T. B.
**Peach harvesting studies, 1953. Post harvest fungicides.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 39-43.

Dowicide A (M-148) at the rate of 0·10%, used as a post-harvest dip, severely increased rot counts on Elberta peach, as compared with the controls, and also induced internal browning in the flesh next to the pit. Dusting the fruits with sulphur slightly reduced the rot counts, but had a shrivelling effect on the fruits.—Exp. Stat., Harrow, Ont.

3674. Anon.
**A new fungicide.**
*World Crops*, 1954, **6**: 324.

Orthocide 50 Wettable contains 50% captan, N-trichloromethylthiotetrahydrophthalimide. It is not compatible with oils, strongly alkaline materials or strong lime-sulphur. It is normally applied at 2½%. No susceptible crop varieties have yet been found in this country. The material gives a better finish to fruit and leaf than most insecticides. At nornal concentrations it is non-poisonous to warm-blooded animals but the powder has an irritant effect if inhaled. Orthocide 50 Wettable equals lime-sulphur as a protectant against apple and pear scab but is not so good an eradicant as mercury sprays. Good results are reported against *Botrytis* on strawberries, downy mildew on hops, *Phytophthora* on outdoor tomatoes, *Gloeosporium* on stored apples and *Fusarium* and *Botrytis* rots on flower bulbs and corms.

3675. Nelson, F. C., and Fiero, G. W.
**A selected aromatic fraction naturally occurring in petroleum as a pesticide solvent.**
*J. agric. Food Chem.*, 1954, **2**: 735-7, bibl. 3.

Heavy aromatic naphtha, a selected fraction naturally occurring in petroleum, is an excellent solvent for pesticide formulations even at low temperatures. Its lower boiling range results in more rapid evaporation, an advantage when used for household or agricultural applications. Used in normal concentrations, it appears to be nonphytotoxic to pears, tomatoes, apples, celery, or citrus fruits and no more phytotoxic to corn than other commercial aromatic solvents. Animal toxicity studies indicate that there is no health hazard in connexion with its uses as a pesticide solvent. [Authors' abstract.]

3676. Anon.
**Endrin—a new Shell insecticide.**
*World Crops*, 1954, **6**: 313.

Endrin, a stereo-isomer of dieldrin, controls caterpillars and many aphids in addition to the range of insects controlled by dieldrin. Outstanding results have been obtained against *Stephanoderes hampei* and *Dichocrocus crocodora* on coffee, *Pyrilla* sp. and *Scirpophaga nivella* on sugar cane, and some tobacco pests. Application rates normally range from 0·2 to 0·5 lb. per acre. The product is marketed as the technical material (90%), a 19·5% emulsifiable concentrate and as dusts and wettable powders. Although more toxic to small laboratory animals than dieldrin, endrin can be used without difficulty in the field provided ordinary commonsense precautions are taken with the concentrated materials.

3677. Reich, H.
Die Wirkung von Metasystox—einem weniger giftigen systemischen Insektizid—auf Sägewespe, Rote Spinne und Blattläuse in den Versuchen 1953. (**The action of Metasystox—a less toxic systemic insecticide —on sawfly, red spider and aphids in the 1953 experiments.**)
*Mitt. ObstbVersuchsringes Jork*, 1954, **9**: 163-5.

Metasystox, a new systemic insecticide produced by Bayer, is no more toxic to man than parathion if applied at 0·1%. Tests at Jork showed that a concentration of 0·05% is insufficient for the control of plum sawfly, red spider mite on apple and green apple aphid, but preliminary trials suggest that 0·1% of the new chemical is about as effective as 0·05% systox. In the author's view the somewhat higher price of metasystox applied at an effective concentration is justified by the greater comfort of the worker who can dispense with the special protective clothing designed for systox.

3678. Jones, G. D. G., and Connell, J. U.
**Studies of the toxicity to worker honey bees (*Apis mellifera* L.) of certain chemicals used in plant protection.**
*Ann. appl. Biol.*, 1954, **41**: 271-9, bibl. 14.

The toxicity of 11 chemicals used in plant protection to adult worker honey bees was investigated in the laboratory. The order of effectiveness as stomach and contact poisons was: parathion, TEPP, γ-BHC, dieldrin, aldrin, chlordane, *o*,*o*-diethyl-*o*-ethylmercaptoethyl thiophosphate (a systox constituent), bisdimethylamino fluorophosphine oxide, toxaphene and the sodium salts of 2,4-D and MCPA; as residual films dieldrin, aldrin, γ-BHC, parathion, chlordane and *o*,*o*-diethyl-*o*-ethylmercaptoethyl thiophosphate; toxaphene, TEPP and bisdimethylamino fluorophosphine oxide had no measurable effect; as fumigants the order was dieldrin, γ-BHC, aldrin, parathion, and chlordane; the remainder had no measurable effect.

### *Spray deposits and residues.*

(*See also* 3690h, i.)

3679. Allen, M., and Llewelyn, F. W. M.
**A rapid method of measuring copper deposits on large numbers of individual leaves.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 180-1, bibl. 3.

A method is described for the estimation of copper deposits on leaves, using bis*cyclo*hexanone oxalyldihydrazone as colour-developing reagent. The method is rapid; over 200 determinations a day can be made with ease. [Authors' summary.]

3680. Allen, M., and Llewelyn, F. W. M.
**The estimation of lime-sulphur deposited on leaves.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 182-3, bibl. 1.

A rapid method of estimating the amount of lime-sulphur retained by leaves sprayed in the orchard is described. The method is based on the determination of the calcium content of the lime-sulphur by titration with the disodium salt of ethylenediamine tetra-acetic acid. [Authors' summary.]

3681. Dormal, S.
Le problème des traces d'insecticides dans les fruits et les légumes. (**The problem of insecticide residues in fruit and vegetables.**) [English summary 14 lines.]
*Parasitica*, 1954, **10**: 60-96, bibl. 84.

Notes are given on legislation concerning toxic insecticides in the U.S.A., Britain, France and other countries, and on experiments overseas on the residues of various products on a wide range of fruits and vegetables. Investigations at Gembloux Plant Chemistry Station on BHC and lindane residues on peas and cherries, and on parathion residues on cherries, leeks and strawberries are described. It is concluded that BHC, lindane and parathion do not leave residues toxic to man if properly used at a suitable interval before harvesting.

3682. Gilpin, G. L., Dawson, E. H., and Siegler, E. H.
**Effect of benzene hexachloride sprays on the flavor of fresh, frozen, and canned peaches.**
*J. agric. Food Chem.*, 1954, **2**: 781-3, bibl. 13.

Flavor tests were made on peaches from trees sprayed with four component isomers of technical benzene hexachloride—alpha, beta, gamma, and delta—used individually and also combined as a mixture, or sprayed with commercial gamma isomer. Two dosages of the insecticides were studied. The most pronounced musty or earthy off-flavors were found in the peaches from trees sprayed with a mixture of the isomers.

Off-flavors were noted rather consistently in the different samples of canned and frozen peaches from lots grown on trees sprayed with the delta isomer. In peaches from trees sprayed with the other isomers of benzene hexachloride, flavor was not appreciably different in most instances from that of the untreated control sample. Stored samples of canned and frozen peaches appeared to have more off-flavor than freshly canned or frozen samples. In general, canned samples had the highest incidence of off-flavor, frozen samples less than canned, and raw samples the least. [Authors' abstract.]

3683. BOBB, M. L.
**Parathion residues on peach bark and foliage.**
*J. econ. Ent.*, 1954, **47**: 190-1.

It was observed in Virginia that parathion, applied to peach trees for plum curculio control, substantially reduced San José scale and Forbes scale infestations. The residual effectiveness of the insecticide on peach leaves was less than 1 week; on the bark, however, it was effective much longer, and residues lethal to the scale crawlers remained for at least 4 weeks after application.

3684. DÜRR, H. J. R.
**Parathion spray residue on apples and canned peaches.**
*Fmg S. Afr.*, 1954, **29**: 231-2, bibl. 1.

In experiments at Stellenbosch the fruit was twice sprayed with 15% parathion wettable powder at 1½ lb. to 100 gal. of water. In apples examined at regular intervals the parathion content after 3 weeks was extremely small, namely 0·28 p.p.m. Peaches found to contain 0·29 p.p.m. before canning showed no parathion in the final product.

3685. METCALF, R. L., MARCH, R. B., AND FUKUTO, T. R.
**Study of systemic insecticides.**
*Calif. Agric.*, 1954, **8** (6): 5-6, illus.

Experiments were carried out on the quantitative estimation of the residues from systox sprays by means of isotopes containing radio-phosphorus. Systox at the rate of 0·25 lb. per 100 gal. was sprayed onto young walnut, orange and apple trees. At harvest, 4 weeks later, the systox residues calculated were: walnut meat 0·009 p.p.m., orange juice 0·02 p.p.m. and apples 0·007 p.p.m. [See also *H.A.*, 24: 2523.]

## *Apparatus.*

(*See also* 3439.)

3686. CHAO, Y-C., AND ROBERTS, J.
**A dust mixer for economic poisons.**
*J. econ. Ent.*, 1954, **47**: 353-4, bibl. 1, illus.

The mixer described was constructed primarily to blend wheat samples with insecticides, but it should also be useful in various laboratory studies.

3687. MAUCH, A.
Die technischen Erfahrungen mit Sprühgeräten. **(Technical observations on mist blowers.)**
*NachrBl. dtsch. PflSchDienst., Braunschweig*, 1954, **6**: 73-5, illus.

Four German models of mist blowers were tested in orchards with special reference to droplet size, coverage, range and penetration into the tree top.—Obstbauversuchsanst. Jork.

3688. N.I.A.E.
**Report on test of orchard mist spray attachment. Test No. R.53053.**
[*Publ.*] *N.I.A.E.* No. **85**, 1953, pp. 18.

In this report on a Danish sprayer the following among other points are noted. The rate of working possible is likely to satisfy the needs of small- and medium-acreage growers. Application rates from approx. 200 gallons downwards can be achieved. It is capable of producing a spray coverage which compares quite favourably with other machines in the same class (application rate), provided that the spraying of very tall or very dense trees is not attempted. Certain modifications are suggested.

## *Noted.*

3689.

a BARNES, M. M., ROBINSON, D. W., AND FORBES, A. G.
**Attractants for moths of the Western grape leaf skeletonizer.**
*J. econ. Ent.*, 1954, **47**: 58-63, bibl. 5.
*Harrisina brillians.*

b BESSARD, —., AND PERROT, A.
Les tétranyques des arbres fruitiers. **(Fruit tree mites.)**
*Arbor. fruit.*, 1954, No. 4/5, pp. 5, 7-10, illus.
Biology and control of *Metatetranychus ulmi*, *Tetranychus urticae* and *Bryobia praetiosa*.

c BOYLE, J. S., DUAIN MOORE, J., AND KEITT, G. W.
**Cucumber as a plant host in stone fruit virus research.**
*Phytopathology*, 1954, **44**: 303-12, bibl. 15, illus.

d CASIDA, J. E., AND OTHERS.
**Metabolism of schradan by plants and insects to a toxic phosphoramide oxide.**
*J. econ. Ent.*, 1954, **47**: 64-71, bibl. 32.

e DICKER, G. H. L.
**The apple, pear, and quince aphids.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 213-17, illus.
Characters and brief biological notes on 11 species.

f DUNEGAN, J. C.
**Identification of the *Tranzchelia* rust attacking capulin cherry.**
From abstr. in *Phytopathology*, 1954, **44**: 388-9.
As *T. pruni-spinosae*.

g EUROPEAN PLANT PROTECTION ORGANIZATION.
**_Hyphantria cunea_ Drury. Fall webworm. Report of the 3rd International Conference (Vienna, February 22nd, 1954).**
[*Publ.*] *Eur. Plant Prot. Org.* [*EPPO*], 1954, pp. 20.
Pest of mulberry trees, now spreading in Europe.

h EUROPEAN PLANT PROTECTION ORGANIZATION.
**_Ceratitis capitata_ Wied. Report of the international conference on Mediterranean fruit fly (Algiers, January 26-29, 1954).**
[*Publ.*] *Eur. Plant Prot. Org.* [*EPPO*], 1954, pp. 27, bibl. in text.

i FAUST, J.
Verhütung von Früh- und Spätfrösten im Wein- und Obstbau. **(The prevention of early and late frosts in vineyard and orchard.)**
*Flugbl. biol. Bundesanst. Braunschweig* **L2**, 1954, pp. 8, illus.
Types of frost and measures for prevention of damage.

j FORESTRY COMMISSION.
**Traps for grey squirrels.**
[*Publ.*] *For. Commiss.*, 1954, pp. 9, illus.

k FRANZ, J.
Die Erfolgskontrolle bei der biologischen Schädlingsbekämpfung. **(The evaluation of results in biological pest control.)** [English summary 11 lines.]
Reprinted from *Allg. Forst- u. Jagdztg, 1954*, **125**: 193-9, bibl. 44.

l HEIN, A.
Die Bedeutung der Unkräuter für die Epidemiologie pflanzlicher Virosen. **(The role of weeds in the spread of plant virus diseases.)**
Reprinted from *Dtsch. Landw.*, 1953, No. 10, pp. 4, bibl. 31.

m HELMKAMP, G. K., AND OTHERS.
**Residue analysis. Direct potentiometric method for chloride ion applied to residues of chlorinated insecticides.**
*J. agric. Food Chem.*, 1954, **2**: 836-9, bibl. 8.
For amounts down to 0·02 p.p.m. of chloride ion.

n HEWITT, W. B.
**Grapevine mosaic.**
*Bull. Calif. Dep. Agric.*, 1950, **39**: 61, bibl. 2, coloured plates [received 1954].
Symptoms [see also *H.A.*, 16: 744 and 24: 3720].

o HEWITT, W. B.
**Fanleaf—another vine disease found in California.**
*Bull. Calif. Dep. Agric.*, 1950, **39**: 62-3, coloured plates [received 1954].
Apparently the same disease as court-noué, its symptoms are described and illustrated [see also *H.A.*, 21: 342].

p HILDEBRAND, E. M.
**Relative stability of fire blight bacteria.**
*Phytopathology*, 1954, **44**: 192-7, bibl. 12.
*Erwinia amylovora.*

q HORNSTEIN, I., AND SULLIVAN, W. N.
**The role of chlorinated polyphenyls in improving lindane residues.**
*J. econ. Ent.*, 1953, **46**: 937-40, bibl. 8.

r JENSEN, D. D.
**Longevity of the leafhoppers _Colladonus geminatus_ (Van Duzee) and _Colladonus montanus_ (Van Duzee) on peach.**
*J. econ. Ent.*, 1953, **46**: 1120-1, bibl. 6.

s KALOOSTIAN, G. H.
**_Tomosvaryella lepidipes_—a parasite of the geminate leafhopper.**
*J. econ. Ent.*, 1953, **46**: 1098-9, bibl. 1.
*Colladonus geminatus*, vector of western X-virus.

t KENNETT, B. H.
**Determination of ethylene dibromide and ethylene chlorobromide in air.**
*J. agric. Food Chem.*, 1954, **2**: 691-2, bibl. 4.
As when used for fumigating fruits.

u KIRBY, A. H. M., AND READ, W. H.
**The toxicity of phenyl benzenesulphonate and some chlorinated derivatives towards eggs of certain tetranychid mites.**
*J. Sci. Food Agric.*, 1954, **5**: 323-30, bibl. 17.

v KIRBY, A. H. M., AND GAMBRILL, R. G.
**The hatching of summer eggs of the fruit tree red spider mite, _Metatetranychus ulmi_ (Koch), under artificial conditions.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 175-9, bibl. 3.
Effects of temperature and light.

w KLENK, —., AND WINKLER, —.
Frostschutz im Wein-, Obst- und Gartenbau. **(Frost protection of vines and fruit trees.)**
*Tech. Bauern Gärtn., Ausg. A*, 1954, **6**: 134-6, 159-64, illus.
Comparative costs of heaters and sprinkler irrigation.

x MARCH, R. B., METCALF, R. L., AND FUKUTO, T. R.
**Paper chromatography of the systemic insecticides, demeton and schradan.**
*J. agric. Food Chem.*, 1954, **2**: 732-5, bibl. 13.

y MARTIN, J. T.
**Systemic insecticides.**
*N.A.A.S. Quart. Rev.*, 1954, No. 24, pp. 145-51, bibl. 9.
A survey of their development.

z MINISTRY OF AGRICULTURE, LONDON.
**Apple aphids.**
*Adv. Leafl. Minist. Agric. Lond.* **106,** revised 1954, pp. 5, illus.
4 species and their control.

3690.

a MINISTRY OF AGRICULTURE, LONDON.
**Swift moths.**
*Adv. Leafl. Minist. Agric. Lond.* **160,** revised 1954, pp. 4, illus.
*Hepialus humuli* and *H. lupulinus.*

b MINISTRY OF AGRICULTURE, LONDON.
**Woolly aphid.**
*Adv. Leafl. Minist. Agric. Lond.* **187,** revised 1954, pp. 5.
*Eriosoma lanigerum* and its biological and chemical control.

c MINISTRY OF AGRICULTURE, LONDON.
**Apple mildew.**
*Adv. Leafl. Minist. Agric. Lond.* **205,** amended 1954, pp. 4, illus.
*Podosphaera leucotricha.*

d MINISTRY OF AGRICULTURE, LONDON.
**Spraying programme for apples and pears.**
*Adv. Leafl. Minist. Agric. Lond.* **332,** revised 1954, pp. 4, illus.

e MOORE, M. H.
**Is concentrate spraying with lime-sulphur a practical proposition?**
*A.R. E. Malling Res. Stat. 1953,* 1954, **A37**: 210-12.
Experience discussed suggests that the answer is probably yes.

f NICHOLS, L. P., AND BAUER, A. H.
**Raspberry and blackberry disease control.**
*Circ. Pa agric. Ext. Serv.* **431,** 1954, pp. 13, illus.
Recognition and control.

g NOLTE, H. W.
Über Knospen- und Rindengallen der Pflaumen. **(Bud and bark galls of plums.)**
*Anz. Schädlingsk.,* 1954, **27**: 6-7, from abstr. in *PflSch. Ber. Wien,* 1954, **12**: 198.
Caused by the gall midge *Eriophyes phloeocoptes.*

h NORRIS, M. V., VAIL, W. A., AND AVERELL, P. R.
**Colorimetric estimation of malathion residues.**
*J. agric. Food Chem.,* 1954, **2**: 570-3, bibl. 3.

i O'DONNELL, A. E., AND OTHERS.
**Chemical determination of aldrin in crop materials.**
*J. agric. Food Chem.,* 1954, **2**: 573-80, bibl. 10.
Two methods of determining aldrin residues of the order of 0·1 p.p.m.

j PELLETIER, R. L., AND KEITT, G. W.
***Venturia inaequalis* (Cke.) Wint. VI. Amino acids as sources of nitrogen.**
*Amer. J. Bot.,* 1954, **41**: 362-71, bibl. 25.

k PRINCI, F.
**The toxicity hazard of aldrin, dieldrin and other chlorinated hydrocarbon insecticides.**
*World Crops,* 1954, **6**: 330-2.

l QUANTZ, L.
Viruskrankheiten der Himbeeren und Erdbeeren. **(Virus diseases of raspberries and strawberries.)**
*Z. PflKrankh.,* 1953, **60**: 599-609, bibl. 18.

m RAMBIER, A.
Un acarien nuisible méconnu: le tétranyque du pommier. **(A little known injurious mite: apple tetranychid.)**
*C.R. Acad. Agric. Fr.,* 1954, **40**: 340-3, bibl. 5.
*Amphitetranychus viennensis.*

n REYNOLDS, H. T.
**Entomological aspects of systemic pesticides.**
*Agric. Chemls,* 1954, **9**: 28-31, 113, 115, bibl. 28.

o RICH, S., AND HORSFALL, J. G.
**Fungitoxicity of ethylenethiourea derivatives.**
*Science,* 1954, **120**: 122, 123, bibl. 15.

p ROOSJE, G. S., AND VAN DINTHER, J. B. M.
**The genus *Bryobia* and the species *Bryobia praetiosa* Koch.**
*Meded. PlZiekt. Dienst* **60,** 1953, reprinted from *Ent. Ber.,* 1953, **14**: 327-36, bibl. 36.

q SCHLOCKER, A., AND NYLAND, G.
**Yellow leaf roll of peach.**
*Bull. Calif. Dep. Agric.,* 1951, **40**: 39-42, illus. [received 1954].
With coloured photographs of virus symptoms. [See also *H.A.,* 22: 305.]

r SEMEL, M.
**A study of concentrate spraying of apple trees with the Cornell experimental rotatable outlet mist concentrate sprayer.**
*Diss. Abstr.,* 1954, **14**: 905, being *Publ.* 8199 of 200 pp.

s STAPLEY, J. H.
**Recent developments in the use of insecticides on horticultural crops.**
*J. roy. hort. Soc.,* 1954, **79**: 302-8, bibl. 6, illus.
Post-war methods and materials.

t STOBWASSER, H.
Probleme der Anwendung von Aerosolen im Pflanzenschutz und Methodik ihrer Herstellung und Untersuchung im Laboratorium. **(The application of aerosols in plant protection and methods of their manufacture and study in the laboratory.)**
*Z. Aerosolforsch. u.-therapie,* 1953, **2**: 713-29, from abstract in *Z. PflKrankh.,* 1954, **61**: 283-4.

u STOUT, G. L.
**Peach mosaic.**
*Bull. Calif. Dep. Agric.,* 1951, **40**: 43-5, illus. [received 1954].
With coloured photographs of symptoms.

v Stout, G. L., Schlocker, A., and Wagnon, H. K.
**Peach yellow bud mosaic.**
*Bull. Calif. Dep. Agric.*, 1952, **41**: 53-7, bibl. 4, illus. [received 1954].
With photographs in colour and black and white.

w Thiem, H.
Wie ernte ich madenfreie Kirschen? (**How to harvest grub-free cherries.**)
*Flugbl. biol. Bundesanst. Braunschweig* **K13**, 2nd edition, 1954, pp. 8, illus.
Control of cherry fruit fly.

x Uhlig, S.
Windschutzanlagen auf der Hohen Rhön. (**Windbreaks in the Rhön highlands.**)
*Mitt. dtsch. Wetterdienst.*, 1954, No. 9, pp. 17, bibl. 5, illus.

y U.S. Interdepartmental Committee on Pest Control.
**Dichlone—a coined name for the fungicidal chemical 2,3-dichloro 1,4-naphthoquinone. Glyodin—a coined name for the fungicidal chemical 2-heptadecyl glyoxalidine acetate.**
*Phytopathology*, 1954, **44**: 370.
Marketed under the trade names Phygon and Crag Fruit Fungicide 341 respectively.

## WEEDS AND WEED CONTROL.

### *General.*

(*See also* 3333, 3375-3387, 3689 l, 4465.)

3691. Bohmont, D. W.
**Recommendations for weed control in Wyoming 1954.**
*Mimeo. Circ. Wyo. agric. Exp. Stat.* **37**, 1954, pp. 7.

Including soil sterilants, selective control of perennial weeds, aquatic weed control and new compounds.

3692. Stahler, L. M.
**Weed control in Northern Europe.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 72-84.

Weed problems and methods of solving them, observed on a tour of Great Britain, Ireland, Sweden and Denmark, are discussed, and compared with some control measures used under similar conditions in North America.

3693. Green, K. R.
**Weed control with chemicals.**
[*Publ.*] *N.S.W. Dep. Agric., Div. Plant Ind.*, 1954, pp. 35, illus.

A comprehensive review discussing many aspects of chemical weed control with special reference to Australia, where the value of herbicides sold annually is well above £1,000,000. In 4 tabulated appendices weed control in specific crops, plant reaction to 2,4-D and 2,4,5-T, available commercial herbicides and dilution rates for 2,4-D and MCPA are given.

3694. Freed, V. H., and others.
**Chemical weed control recommendations.**
*Stat. Bull. Ore. agric. Exp. Stat.* **539,** 1954, pp. 23, illus.

Some general recommendations are given on weed control, including that in fruit, vegetables and flowers. Control of woody species, aquatic weeds, perennial weeds and soil sterilization are also discussed.

3695. Zonderwijk, P.
Onkruidbestrijding met chemische middelen. (**Weed control with chemicals.**) [English summary ½ p.]
*Meded. PlZiekt. Dienst* **111,** revised 1954, pp. 91, illus., fl. 1.85.

The chemical control of weeds in the Netherlands is covered, most of the results having been obtained from field experiments by the Plantenziektenkundige Dienst [Plant protection service]. Chapter I contains descriptions of selective and pre-emergence weedkillers, their action, methods of application, and weather conditions necessary for their use. The practical use of selective weedkillers in rootcrops and other Umbelliferae, onions, bulbs, peas, strawberries and conifers is covered in Chapter II. Weed control in grassland and lawns and the use of non-selective herbicides is described in subsequent chapters. In Appendix 1 the most important Dutch weeds of grassland and arable crops are described by families, with information on their occurrence, habit, and seed germination; Appendix 2 tabulates the susceptibility of these weeds to dinitro- and hormone weedkillers. Appendix 3 gives the chemical structure of the organic compounds described in Chapter I. [See also *H.A.*, 24: 1479.]

3696. Skinner, H. R. W., Little, E. C. S., and Thompson, F. B.
**Total weed destruction.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 72-84, bibl. 6.

Three papers, discussing methods and materials used for destruction of all vegetation in specific areas.

3697. C.S.I.R.O., Australia.
**Biological control of weeds and pests.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 67-8.

Notes are given on results obtained and investigations being made in Australia for the biological control of 4 weeds, namely St. John's Wort (*Hypericum perforatum*), Crofton weed (*Eupatorium glandulosum*), *Lantana camara*, and Noogoora burr (*Xanthium pungens*), and pests, cabbage moth (*Plutella maculipennis*), cabbage butterfly (*Pieris rapae*), green vegetable bug (*Nezara viridula*), and red scale (*Aonidiella aurantii*).

### *Herbicides.*

(*See also* 3678, 3759b, f, g, i, l, m, 4007, 4033.)

3698. Crafts, A. S.
**Herbicides.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 253-82, bibl. 249.

The literature discussed in this review is largely that which has appeared since 2 previous reviews on herbicides in this journal. It is mainly concerned with work on the toxicity of hormone-like herbicides, with some consideration of other materials.

3699. Matthews, L. J., and others.
**New Zealand experiences with new weed-killers.**
*Proc. 6th N.Z. Weed Control Conf., 1953*, Massey agric. Coll., pp. 27-37, bibl. 9.

Four papers are presented under this heading: I. (L. J. Matthews). Amine DNOC (diethylamine salt of DNOC) is 50% less toxic to humans than DNOC itself or the sodium salt and is highly soluble in water. It was used experimentally for weed control in clover and is to be tested in large-seeded crops. II. (P. S. Ferens). Two unnamed, imported experimental products showed promise for gorse control. ATA (amino triazole) added to 2,4,5-T gave excellent control of gorse without permitting any regrowth. ATA produces albinism in plants by inhibiting chlorophyll formation and has horticultural uses in producing white flowers and Christmas trees, and might possibly be used for marking football fields, tennis courts, etc. Other materials mentioned are maleic hydrazide and polyethylene glycol esters of 2,4-D. III. (F. B. Thompson). Oktone (octachlorocyclohexanone) for weed control in brassicas, endothal in beans and peas and MCP and 2,4-D for pre-emergence treatments. IV. (J. S. Yeates). Maleic hydrazide did not control dock. It prevented sprouting in the onion variety Pukekohe Long-keeper but caused rot, and when applied to prolong dormancy in flower bulbs damaged *Lilium auratum* without delaying sprouting.

3700. Crafts, A. S., and Buck, C. C.
**Herbicidal properties of arsenic trioxide.**
*Bull. Calif. agric. Exp. Stat.* **739,** 1954, pp. 28, bibl. 11, illus.

Arsenic trioxide is an economic and very effective long-term soil sterilant, suitable for control of vegetation along the lining of irrigation ditches, road sides, rail tracks, power lines, air strips and on parking areas and fire lines. It is less hazardous than sodium arsenite. The material should be used dry as dust, dust powder, or pellets and, because of its lack of toxicity during the year of application, where perennial weeds are present an additional soil sterilant of greater solubility should be incorporated. In greenhouse toxicity studies the concentration series used was from 40 to 4,840 p.p.m. $As_2O_3$ in air-dry soil; in small field plots and large-scale operations effective rates varied from 1,000 to 2,000 lb. per acre.

3701. Stone, J. D., and Smith, L. M.
**An evaluation of borate and chlorate herbicides.**
*Agric. Chemls*, 1954, **9** (5): 50-1, 53, 131, 135, bibl. 14.

The data showed that on the range of plants tested [including kidney bean and zinnia] and within the limitations of the methods used, a unit of boron trioxide is equivalent to a like unit of sodium chlorate as a plant toxicant. The data further indicate that a unit of compound C (25% sodium chlorate and 75% sodium polyborates) is equivalent to a unit of compound D (40% sodium chlorate and 60% sodium polyborates), and that a unit of either is equivalent to a like unit of straight sodium chlorate at concentrations above 100 p.p.m. in the soil water solution. [From authors' summary.]

3702. Rosanow, M.
**Spraying Chilean nitrate as a combined nitrogen dressing and weed killer.**
*Inf. Chil. Nitr. agric. Serv.* **22,** 1954, pp. 5, bibl. 6, illus.

In a review of recent experiments it is shown that Chilean nitrate of soda sprayed on table beets about 1 month after sowing at 270 lb. plus 1 gal. of spreader in 100 gal. per acre gave very good weed control at a lower cost than hand weeding, and resulted in a 20% yield increase. Weeds found susceptible, partially susceptible and resistant to Chilean nitrate are listed.

3703. Bleidner, W. E.
**Application of chromatography in determination of micro quantities of 3-(*p*-chlorophenyl)-1,1-dimethylurea [CMU].**
*J. agric. Food Chem.*, 1954, **2**: 682-4, bibl. 5.

The method described makes it no longer necessary to analyse a corresponding sample of an untreated plant in order to correct for interfering materials.

3704. Bleidner, W. E., and others.
**Determination of 3-(*p*-chlorophenyl)-1,1-dimethylurea in soils and plant tissue.**
*J. agric. Food Chem.*, 1954, **2**: 476-9, bibl. 4, illus.

The colorimetric method described is capable of detecting as little as a few parts per 1,000 million CMU in refined cane sugar and a few parts per 10 million in nearly all plant tissues and soils. [From authors' abstract.]

3705. Roberts, H. A.
**Weed investigations.**
*A.R. nat. Veg. Res. Stat. Wellesbourne for 1953*, 1954, pp. 36-7, bibl. 2.

Studies have been made on the phytotoxicity of CMU (3-(p-chlorophenyl)-1,1-dimethylurea) with the following results: 80% control of shepherd's purse (*Capsella bursa-pastoris*) and annual meadow grass (*Poa annua*) was obtained with rates of less than ¼ lb. per acre. Similar control of fat hen (*Chenopodium album*), chickweed (*Stellaria media*), corn spurrey (*Spergula arvensis*) and groundsel (*Senecio vulgaris*) was obtained when ½ lb. per acre was used. Knotgrass (*Polygonum aviculare*) was controlled to the same degree by 1 lb. per acre, while ivy-leaved speedwell (*Veronica hederifolia*) and fumitory (*Fumaria officinalis*) were tolerant to doses of up to 2 lb. per acre. Of vegetable crops tested, radish and lettuce were very susceptible to CMU; carrots and red beet were unaffected by rates of up to ½ lb. per acre, but this rate had an adverse effect on onions. Other experiments with pentachlorophenol in vaporizing oil and oil/water emulsions gave excellent results as a pre-emergence spray for lettuce.

3706. Carlson, A. E.
**Applications of substituted urea herbicides.**
*Agric. Chemls*, 1954, **9** (6): 44-5, 155, 157, illus.

In Hawaii a wettable powder formulation of 3-(p-chlorophenyl)-1,1-dimethylurea, called "Karmex" W, has given very good control of annual weeds in sugar cane when applied at the rate of 4 lb. of active ingredient per acre immediately following planting. The material used at 4 lb. per acre also showed promise for weed control in pineapples and asparagus. Suitable equipment for applying wettable powder formulations of substituted urea compounds is described and the use of "Karmex" W at high rates for out-of-season weed control in irrigation ditches and as soil sterilant for bare fallow areas is mentioned.

3707. Hogsett, J. N., and Funk, G. L.

**Determination of residual Crag herbicide 1 and its hydrolysis products on food crops.**

*Analyt. Chem.*, 1954, **26**: 849-53, bibl. 10.

A procedure is described for the quantitative estimation of as little as 0·018 mg. of Crag herbicide 1 (2-(2,4-dichlorophenoxy) ethyl sulphate) on food crops by measuring the intensity of the coloured complex formed with methylene blue chloride. Data are presented on the application of the method to the determination of Crag herbicide 1 and its hydrolysis products on several vegetables, and on strawberries, grapes and sugar cane.

3708. Harry, J. B., and Pass, H. A.

**Recent tests with chlorinated phenoxyethyl compounds as herbicides in established plants.**

*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 108-13, bibl. 2.

Responses of vegetables and ornamentals to applications of sodium 2,4-dichlorophenoxyethyl sulphate (Ses), 2,4-dichlorophenoxyethyl benzoate (Sesin) and sodium 2,4,5-trichlorophenoxyethylsulphate (Natrin) are discussed. Natrin caused the least crop injury and showed promise for weed control in established crops such as tomatoes, tobacco and cabbage. SES had earlier been found suitable for weed control in strawberries, raspberries and other cane fruits.

3709. Shafer, N. E.

**Soil applications of 2,4-D for the eradication of deep-rooted perennial weeds.**

*Down to Earth*, 1954, **9** (4): 12-13, bibl. 2.

In trials in Nebraska 40 lb. of 2,4-D per acre completely eradicated leafy spurge, *Euphorbia esula*, 20 lb. gave over 95% control of hoary cress, *Cardaria draba*, 60 lb. resulted in more than 90% kill of tanweed, *Polygonum coccineum*, and a combination of 20 lb. 2,4-D and 20 lb. CMU resulted in 99% control of Russian knapweed, *Centaurea repens*. Of the 2,4-D formulations used the amine salt and micronized acid gave the best results.

3710. Miller, L. P., Weed, R. M., and Hitchcock, A. E.

**Comparative volatility of the *n*-butyl, 2-ethylhexyl, and 2-(2-ethoxyethoxy)propyl esters of 2,4-D.**

*Contr. Boyce Thompson Inst.*, 1954, **17**: 397-400, bibl. 2.

The rates of evaporation of the *n*-butyl, 2-ethylhexyl and 2-(2-ethoxyethoxy)propyl esters of 2,4-D at room temperature in a ventilated hood were determined with the aid of $C^{14}$-labelled esters. The relative volatility was found to be 50, 3, and 1 for the 3 esters. [From authors' summary.]

3711. Sheat, D. E. G.

**Effects of 2,4-dichlorophenoxyacetic acid on certain alkaloidal plants.**

*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 102-5, bibl. 18.

Results of experiments at the Massey Agricultural College suggest that lupins of differing alkaloid content and at various stages of maturity did not respond differentially to treatment with 2,4-D, and that with hemlock (*Conium maculatum*) this material did not affect the alkaloid content of the leaves.

3712. Schmidt, O.

Vergleichende Untersuchungen über die herbizide Wirkung der synthetischen Wuchsstoffe 2,4-D und MCPA. (**Comparative studies on the herbicidal action of the synthetic growth substances 2,4-D and MCPA.**)

*Mitt. biol. Zentralanst. Berlin-Dahlem* **77**, 1954, pp. 119, bibl. 103, illus.

Plants susceptible to both growth substances reacted to applications of 2,4-D and MCPA similarly, though the effects of MCPA were often more rapid. Weeds propagated by seed were most susceptible in the earliest stages of development and those propagated by roots shortly before flowering or during the period of most active longitudinal growth. MCPA caused much less crop damage than 2,4-D. Weeds which were found more susceptible to MCPA than to 2,4-D and *vice versa*, and those which were equally susceptible are listed. A drop in the temperature during or immediately after treatment prolonged or inhibited response. High humidity after application improved herbicidal action, rain reduced it. Other factors affecting responses were soil, nutritional and light conditions. Increased quantities produced correspondingly increased effects within the limits of plant reaction, and there was a differential response to the various salts of 2,4-D and MCPA. The concentration of the same amount of active principle in the spray applied per unit area had little effect on the intensity of response. The temperature of the spray mixture was of no importance. A long list of weeds showing different degrees of susceptibility to 2,4-D and MCPA, as established by 4 independent authors, is given.

3713. Linser, H., Frohner, W., and Kirschner, R.

Formbildende Wirkungen von Wuchsstoffen. (**Formative effects of growth substances.**) [English summary 1 p.]

*Phyton*, 1953, **3**: 53-107, bibl. 23, illus.

Sodium salts of 2,4-D and 2,5-D were applied in 0·1% solutions (1 kg. in 1,000 l. per ha.) to many plants, primarily weeds, under glasshouse conditions. The damage caused to the different species, varying from temporary retardation of growth to severe malformation and eventual death, is described, and some of the morphological changes produced in different plant organs are clearly illustrated.

3714. Poland, J. L.

**History and development of endothal.**

*Proc. 7th Mtg east Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 94-8, bibl. 8.

The word "Endothal" designates technical grade 3,6-endoxohexahydrophthallic acid. The 2 types in use are 3003-Endothal, an aqueous solution containing 2 lb. per U.S. gal. of technical grade disodium salt of endothal for soil treatments as a pre-emergence herbicide, and 4069-Endothal which contains $\frac{2}{3}$ lb. of disodium salt of endothal plus $3\frac{1}{3}$ lb. of ammonium sulphate per U.S. gal. and is used as contact herbicide, defoliant or crop desiccant.

3715. Cruickshank, J. A.
**Present status of naphthyl phthalamic acid.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 124-6.

Notes are given summarizing reports received on weed control experiments with naphthyl phthalamic acid (Alanap) in cucurbits, asparagus, peas and gladiolus.

3716. Coulter, L. L.
**Silvex a new selective herbicide for weed and brush control.**
*Down to Earth*, 1954, **9** (4): 18-20, bibl. 5, illus.

Silvex, 2(2,4,5-trichlorophenoxy)propionic acid, is a growth regulator similar in certain respects to 2,4-D and 2,4,5-T. It does not, however, cause the severe formative effects on cotton associated with the other materials and is more effective than 2,4,5-T against certain oak species. Foliage sprays of silvex have given control, comparable to that obtained with 2,4,5-T, of 13 woody plants. Basal or cut-surface applications have not been encouraging. For pre-emergence weed control in asparagus silvex at 2 and 4 lb. per acre gave much better results than 2,4,5-T at similar rates.

### *Particular weeds.*

(*See also* 3759c, d, h, j, k, p, 3960.)

3717. Bohmont, D. W.
**Weeds of Wyoming.**
*Bull. Wyo. agric. Exp. Stat.* **325,** 1953, pp. 160, bibl. 10, illus.

Descriptions and full-page line illustrations are given of some 75 weeds, 25 of which are proclaimed noxious in the State, with notes on distribution, origin and control. Each weed is listed in an index by common and scientific names and under the plant family to which it belongs.

3718. C.S.I.R.O., Australia.
**Plant toxicology and chemical weed control.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 34-5.

*Mistletoe investigations:* the optimal dose of 2,4-D may vary from year to year. *Grass weeds:* Sodium trichloracetate has given good results on Johnson grass (*Sorghum halepense*), couch grass (*Cynodon dactylon*), and paspalum (*Paspalum dilatatum*).

3719. Chakravarti, S. C., and Pershad, G. D.
**Studies on the viability of immature weed seeds.**
*Indian J. agric. Sci.*, 1953, **23**: 153-5, bibl. 2.

The viability of some Indian weed seeds was investigated. *Melilotus indica* and *Anagallis arvensis* showed hardly any difference in the germination percentage of mature and immature seeds. *Argemone mexicana*, *Lathyrus aphaca*, *Solanum nigrum* and *Vicia hirsuta* gave increased germination with increasing maturity. Immature seeds of *Asphodelus tenuifolius* germinated better than mature seeds.

3720. Rasmussen, L. W.
**Factors which determine the effectiveness of growth regulator herbicides on Canada thistle.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 7-9.

In Washington 2,4-D was found to be more effective than 2,4,5-T for controlling Canada thistle [*Cirsium arvense*]. The stage of development of the plants at the time of treatment was a highly significant factor influencing the degree of control. The greatest stand reductions resulted from applications of 2,4-D in the autumn, when vegetative growth is limited, the leaves are young and succulent and carbohydrate translocation is at a relatively high level.

3721. Grène, G.
Le problème de la destruction des Digitaires sanguines et des Sétaires vertes dans les gazons. **(The problem of controlling crabgrass and *Setaria viridis* in lawns.)**
*Rev. hort. Suisse*, 1954, **27**: 264-5, illus.

A Swiss firm claims that Herba-tox used at the rate of 50 g. in 100 litres of water for 10 square metres will control crabgrass (*Digitaria sanguinea*) and *Setaria viridis* in lawns. The product also contains a fertilizer.

3722. Hauser, E. W., and Thompson, J.
**Effects of 3-amino-1,2,4-triazole and derivatives on nutgrass and Johnson grass.**
*J. agric. Food Chem.*, 1954, **2**: 680-1, bibl. 5.

In greenhouse tests spray applications of 1 and 4 lb. per acre of aminotriazole caused severe chlorosis in nutgrass (*Cyperus rotundus*) and Johnson grass (*Sorghum halepense*). The chemical was readily translocated and its effects persisted for over 6 weeks. This was not, however, long enough to kill the plants and further investigation is needed on ways of extending the period of reaction and on the effect of combining aminotriazole with tillage operations. The aminotriazole salts of MCP, 2,4-D and 2,4,5-T induced little or no chlorosis in nutgrass.

3723. Bordeleau, R.
**Observations on the reaction of nutgrass (*Cyperus esculentus*) to various herbicides.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 163-5.

In 1948, nutgrass infesting an onion crop was not controlled by any of the herbicides applied. In some later trials in flax CMU and TCA [not used in onions] showed promise. [See also *H.A.*, 24: 2567.]

3724. Templeton, J. K.
**Control of docks with hormone weedkillers.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 17-21.

The relative toxicity of 6 herbicides of the phenoxyacetic acid group, applied at 1 and 2 lb. per acre to broad-leaved dock, *Rumex obtusifolius*, at different stages of development, was studied at the Massey Agricultural College. The experiment carried out on a heavily infested pasture over one season showed that none of the substances was really effective. The amine salt and the ethyl ester of 2,4-D, however, were more promising than the other materials used and it is suggested that they should be used instead of the butyl ester of 2,4,5-T and the sodium salt of MCP in areas where docks are the commonest weeds.

3725. Erickson, L. C.
**The present status of the halogeton problem.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 30-3.
According to 1950 estimates some 4½ million acres are infested with *Halogeton glomeratus* in 6 western states of America.

3726. Holloway, J. K.
**Biological control of klamath weed in California.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 33-5, bibl. 3.
Evidence is presented indicating that the 2 leaf-eating beetles, *Chrysolina hyperici* and *C. gemellata*, will probably give satisfactory control of klamath weed, *Hypericum perforatum*, in all areas within 4 years of release.

3727. Bragg, K. K.
**Poison ivy and bulrush control.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 166-8.
Against poison ivy boron compounds or the cheaper 2,4-D and 2,4,5-T treatments were found satisfactory. The most economical chemical for bulrushes not standing in water was 2,4-D ester. Where the weed was standing in water the addition of fuel oil to the spray was found advantageous.

3728. Allo, A. V.
**Control of rushes with hormone weedkillers in Tauranga.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 12-16.
From experiments conducted over 3 years it is concluded that before full permanent control of rushes can be obtained drainage must be improved. Of the 2 species present, *Juncus effusus* was more easily controlled by hormones than *J. polyanthemos*. For best results rushes should be mown and when 12–18 in. high sprayed with either the ethyl ester or the amine salt of 2,4-D at 2 lb. of acid equivalent per acre. The cost of chemical control was less than half that of mechanical destruction.

### *Control of aquatic weeds.*

(*See also* 3759o.)

3729. Hosticka, H. E., Moran, W. T., and Oborn, E. T.
**Studies of herbicidal action on aquatic weeds using radioactive 5-I, 2,4-D.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 40-8, bibl. 6.
The rate and direction of movement of radioactive iodine, applied in the form of 5-I, 2,4-D, in both emergent and submersed aquatic plants have been measured and recorded. Autoradiograms of the treated plants indicate that the water line, as such, does not act as a barrier for passage of systemic herbicides through the respective aquatic plant systems. [From authors' summary.]

### *Control of woody plants.*

3730. Meadly, G. R. W.
**Weed control in Western Australia.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 22-6.
For control of woody species such as eucalyptus and mesquite (*Prosopis juliflora*) 2,4,5-T was found most satisfactory. Crops in which chemical weed control is carried out are predominantly cereals.

3731. Walker, A. H.
**Chemicals are effective for woody plant control in the south.**
*Down to Earth*, 1954, **10** (1): 10-11, illus.
The chemicals used in brush control may be selective, such as 2,4-D, 2,4,5-T and silvex, or non-selective, such as ammonium sulphamate, arsenic or kerosene.

3732. Quick, C. R.
**Ecology of the Sierra Nevada gooseberry in relation to blister rust control.**
*Circ. U.S. Dep. Agric.* **937**, 1954, pp. 30, bibl. 19, illus., 15 cents.
The Sierra Nevada gooseberry, *Ribes roezli*, is a low shrub which acts as a host for the white pine blister rust, *Cronartium ribicola*. It can be killed by 2,4-D, but some of its seeds survive, remaining dormant for many years. [See also *H.A.*, 24: 1466.]

3733. Brodie, A., Till, J. F., and Duncan, A. A.
**Gorse control.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 94-101.
Methods of applying 2,4,5-T alone and in combination with mechanical destruction of gorse are discussed in 3 papers.

3734. Waywell, C. G.
**A report on the control of hawthorn.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 88-92, bibl. 3.
Satisfactory control of hawthorn (*Crataegus* spp.) was obtained in large-scale trials in Eastern Canada with overall foliage sprays of 2,4-D and with basal and stump treatments of 2,4-D, 2,4,5-T and a mixture of the two. For basal and stump treatments the dormant period was the most suitable time of application, and oil was found to be a better carrier than water. [See also *H.A.*, 24: 2576.]

3735. Emond, R. E.
**The effect of three different oils as carriers for dormant basal bark treatment of hawthornes.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, p. 93.
An oil of 63% aromatic content was found to be a better carrier for 2,4-D and 2,4,5-T than oils of 1% and 4% aromatics of similar boiling range. Complete kill of hawthorns was obtained when 10,000 p.p.m. of 2,4,5-T in the oil of highest aromatic content was applied in April at 250 c.c. per tree trunk.

3736. HOY, J. M., AND OTHERS.
**Manuka blight.**
*Proc. 6th N.Z. Weed Control Conf. 1953*,
Massey agric. Coll., pp. 38-58, bibl. 5.

A lively discussion by 6 interested parties on the control of manuka (*Leptospermum scoparium*) and kanuka (*L. ericoides*) by blight spread by an eriococcid mealy bug. In the agriculturist's and farmer's views, the biological control of manuka is highly desirable, while the soil conservator points out the importance of the plant for soil and water conservation.

3737. HYDER, D. N.
**Spray to control big sagebrush.**
*Stat. Bull. Ore. agric. Exp. Stat.* **538,**
1954, pp. 12, illus.

Adequate control of *Artemisia tridentata* can be obtained with the butyl ester of 2,4-D at 1–1½ lb. in 5–6 gal. water per acre.

3738. BOHMONT, D. W.
**Chemical control of big sagebrush. Effect of chemical treatments upon big sagebrush and associated plants.**
*Mimeo. Circ. Wyo. agric. Exp. Stat.* **39,**
1954, pp. 9.

Sagebrush [*Artemisia tridentata*] is best controlled by 2,4-D. This also affects other broad-leaved plants and results in an increase of grass populations.

## *Weed control in fruit crops.*

(*See also* 3753.)

3739. WAKIL, A., AND GREENHAM, D. W. P.
**Preliminary studies on herbicide applications in raspberry plantations.**
*A.R. E. Malling Res. Stat. 1953*, 1954,
**A37**: 118-20, bibl. 14, illus.

Observation studies, using unreplicated plots, were carried out in a 4-year-old plantation of raspberries of the varieties Malling Enterprise and Malling Landmark. Two applications of either 6·4% or 12·8% oil fortified with 1% or 2% DNC, respectively, failed to control grasses, notably *Poa annua*; fruiting canes were undamaged but the second application killed many young canes. TCA applied on 1 April at 30 lb. per acre killed much of the grass but caused chlorosis of the raspberry leaves and reduced yields. IPC applied on 20 March at 15 lb. per acre kept the plot free from grass but checked the growth of the raspberries. In further trials to observe the effects of herbicides on raspberries maleic hydrazide applied to the soil on 21 May at 2 lb. per acre had no effect on the crop, but the sodium salt of MCPA applied with care to avoid drift at 1 and 2 lb. acid equivalent per acre caused distortion of young canes, though it did not seriously affect cropping.

3740. WIERSZYŁŁOWSKI, J., AND GEDROYĆ, H.
Działanie herbicydu 2,4-D na rośliny drzewiaste w szkółce. **(The effect of 2,4-D on nursery trees.)**
*Roczn. Nauk rol., Ser. A*, 1953, **67** (2): 133-7, bibl. 7, illus.

Applications of 0·1 to 0·8% 2,4-D damaged apples and cherries and the herbicide is considered unsuitable for weed control in Polish nurseries.

## *Weed control in tropical crops.*

(*See also* 3759a, n, 4033.)

3741. TINCKNELL, R. C., AND LOWE, A. C.
**Observations on chemical weed control in the British West Indies.**
*Proc. 8th Congr., int. Soc. Sugar Cane Tech. 1953*, 1954, pp. 296-303, bibl. 13.

A series of herbicide trials in cane was made in British Guiana, Trinidad and Jamaica in 1952. The results and conclusions are given. Where canes are planted deeply and the soil surface is moist and of good tilth, 2,4-D in the form of its sodium salt provides an effective treatment during the initial establishment of the crop. Where canes are planted very near the surface, however, the use of pentachlorophenol obviates the danger of cane damage but nevertheless gives excellent pre-emergence weed control with the additional advantage over 2,4-D that any emerged grass seedlings are adequately controlled. Where a heavy cover of established weeds is present at planting time, the inclusion of a little 2,4-D with the penta is considered desirable. When the soil is liable to dry out appreciably after the application, a joint spray of 2,4-D and pentachlorophenol, applied only when young seedlings have already emerged, is preferred. No treatment involving pentachlorophenol, however, should be applied after the young spikes have broken. Subsequent treatments may either consist of pre-emergence applications of 2,4-D following hoe moulding or post-emergence applications of 2,4-D to established weeds where subsequent cultivations are not undertaken. Predominance of true grasses in the weed flora may necessitate the application of pentachlorophenol, in which case care should be taken to avoid extensive contact of the spray with the young cane leaves. TCA has also shown considerable promise for the treatment of grass infestations in cane. Severe infestations of nutgrass may modify standard routine, since they can only be treated by post-emergence applications of 2,4-D. For pre-emergence work the sodium salt of 2,4-D is preferred on the grounds of economy, but for post-emergence work the amine salt has proved more effective, particularly against nutgrass. Rates of application are somewhat modified by local conditions, but it has been found that 2,4-D is best applied at 2–2½ lb. per acre of acid equivalent when used alone, but this rate may be reduced to 1–1½ lb. per acre when used with pentachlorophenol, itself used at the same rate. Pentachlorophenol alone is generally applied at 3 lb. per acre. TCA, although requiring further experiment, appears to be best used at 5 lb. per acre in cane up to 2 months old though this rate is best doubled as the plants become more mature. In all cases, 20 gallons volume of liquid per acre has proved adequate provided the spray is well distributed. [From authors' conclusions.]

3742. DOMANGUE, D. A.
**Practical aspects of extensive chemical weed control in Louisiana sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 293-5.

Johnson grass (*Sorghum halepense*) infestations were so severe on the properties of Godchaux Sugars Inc. Reserve some years ago that it was thought cane planting would have to be abandoned in places. Control tests begun in 1946 have been so successful, however, that eventual eradication of the weed is envisaged. The programmes for unplanted, plant cane and ratoon areas are described. That for unplanted areas, for example, consists of 6 fallow ploughings at fortnightly intervals in spring and early summer followed by spraying immediately after planting with 1 lb. 2,4-D per acre in the drill area. If necessary, spraying with 4 lb. TCA in the drill area should be followed by mechanical cultivation and hand-roguing.

3743. Narasimha Rao, G., and Dutt, N. L.
**Preliminary weed control studies at Coimbatore.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 270-6, bibl. 8, illus.

The 3 most serious weeds in sugar cane at Coimbatore are *Trianthema portulacastrum*, *Cyperus rotundus* and *Cynodon dactylon*. Three 2,4-D herbicides were tested. Agroxone as a dust and Dicotox as a spray were unsatisfactory. Fernoxone was effective as a spray and as a dust, the best concentrations being 4½ and 3½ lb. per acre respectively.

3744. Stamper, E. R., Hardcastle, W. S., and Chilton, S. J. P.
**Results with certain chemicals for weed control in sugarcane fields in Louisiana.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 305-8.

In the last 3 years the use of chemicals to control Johnson grass and other weeds in sugar cane fields has increased very rapidly in Louisiana. Where broad-leaved weeds, certain annual grasses, and only a few Johnson grass seedlings are present, pre-emergence sprays of 2,4-D have been both successful and economical. In fields where large amounts of Johnson grass seed are present, however, it has been necessary to add TCA (sodium trichloroacetate) to the pre-emergence sprays. Certain disadvantages exist in the use of either or both of these chemicals, and a search has been made for others superior to them. Among those tested, CMU (3(p-chlorophenyl)-1,1-dimethylurea) has shown considerable promise, and this paper reports results of experiments with this chemical in comparison with TCA and 2,4-D. Both advantages and disadvantages exist with CMU in comparison with TCA. It is a better and more persistent herbicide than TCA for broad-leaved weeds. It is primarily a chemical for used both as a pre-emergence and post-emergence spray by adjusting the rate per acre. It is much slower in its action than TCA, making it difficult to determine efficiency of control soon after application. As regards cost, when in production, it will probably be competitive with TCA and 2,4-D at the rates which seem to be necessary.—Louisiana agric. Exp. Stat., and Louisiana State University.

3745. Thakar, C., and Singh, H. N.
**Nilkalami [*Ipomoea hederacea*], a menace to sugar cane.**
*Indian Fmg*, 1954, **3** (10): 12-13, illus.

The annual weed, *Ipomoea hederacea*, causes losses of 20–25% in infested sugar cane fields in the Pusa area of Bihar by twining round clumps, bending the cane, damaging tops, causing stalks to remain undeveloped and interfering with the harvest. Recommended control measures are clean cultivation and spraying with agroxone, fernoxone or phenoxylene.

3746. Eloja, A. L.
**Control of weeds and destruction of diseased abacá plants with herbicides.**
*Philipp. Agric.*, 1953, **36**: 474-91, bibl. 11, illus.

Proprietary brands of 3 derivatives of 2,4-D and of PCP were used at various concentrations and the rate of 1 l. per 5 sq. m. in experiments in 1951/53. The results obtained with *Imperata cylindrica*, *Cyperus rotundus*, *Tithonia diversifolia*, *Lantana camara* and other broad-leafed plants are described. Two 1·5–2·0% 2,4-D sprays on entire stools or cut stalks killed bunchy-topped abacá stools completely.

3747. Naundorf, G.
Herbicidas en cacao. **(Herbicides in cacao.)**
*Cacao en Colomb.*, 1953, **2**: 21-6, bibl. 2.

Experiments showed that DNOC at the normal concentrations and the less volatile derivatives of 2,4-D—such as the sodium salt and the butoxyethanol ester—at 500–750 g. acid equivalent per 6,400 sq. m. can safely be used as herbicides in cacao. The more volatile derivatives, such as the ethanolamine salt and the isopropyl ester, cause some of the flower buds to wither.

3748. Oliver Espinosa, O.
Malezas mas frecuentes en plantaciones de cacao y uso de herbicidas. **(Common weeds of cacao plantations and their control with herbicides.)** [English summary ½ p.]
*Cacao en Colomb.*, 1953, **2**: 103-37, bibl. 11, illus.

The common weeds in cacao plantations in the Cauca valley of Colombia—17 of which are described and illustrated—can be controlled with the sodium salt and the butoxyethanol ester of 2,4-D at not more than 500 g. acid equivalent per 6,400 sq. m. and with DNOC at the makers' recommended rates. The use of a mixture of 2,4-D and DNOC is recommended. Herbicides are most effective when applied 15–30 days after weed cutting.

3749. (Robinson, J. B. D., and Devonshire, C. R.)
**Weedicide observational trial.**
*Mon. Bull. Coffee Bd Kenya*, 1954, **19**: 84-6.

PCP, with or without added 2,4-D, substantially reduced weed growth under coffee, especially when applied both before and after weed emergence, but caused some chemical tainting of the coffee. Low and medium volume fortified PCP gave almost 100% control of nutgrass.

3750. Py, C.
Le problème de la lutte contre les mauvaises herbes dans les plantations d'ananas. **(Weed control in pineapple plantations.)**
*Fruits d'Outre Mer*, 1954, **9**: 191-202, bibl. 13, illus.

Weed control experiments were made in an unirrigated pineapple plantation in Middle Guinea in a locality where the chief weeds are *Imperata cylindrica* and other grasses, various Cyperaceae including *Cyperus rotundus*, *Ageratum conyzoides* and "chiendent".* Notes are given on deep and shallow cultivation, spacing and size of sucker planted as factors in weed control, grass and paper mulching, hand and mechanized weeding, and chemical control with hormone and PCP herbicides.

3751. Rubber Research Institute of Malaya.
**Weed control in young rubber areas—sodium arsenite and wiping with oil.**
*Plant. Bull. R.R.I.M.*, 1954, No. 12, pp. 49-51.

Sodium arsenite at 1% plus spreader or at 2½% without spreader, gives good control of *Imperata* grass when applied 4–5 times at 10-day intervals and at 60–80 gal. per acre for the first application and rather less for subsequent applications. One to two applications are sufficient for bracken or stagmoss but grasses require monthly treatment. Practical hints are given on the use of the spray, which is injurious to rubber trees. Sporadic *Imperata* or *Imperata* weakened by poison spraying may be eradicated by wiping about 4 times at 4-weekly intervals with oils such as diesel fuel.

### *Weed control in vegetables.*

(*See also* 3793, 3794.)

3752. Roberts, H. A.
**Weeds of vegetable crops and their control.**
*N.A.A.S. Quart. Rev.*, 1954, No. 24, pp. 139-45.

A survey was conducted of weed problems on horticultural holdings in England and Wales. Results showed that in vegetable crops of short duration only annual weeds are of general importance, the most troublesome being chickweed, followed by annual nettle, fat hen and annual meadow grass: the first and last of these four are especially serious in autumn-grown crops. Perennial weeds are most serious in perennial crops, such as asparagus. Many growers rely on control by cultivations, which may not always be successful owing to lack of knowledge of weed behaviour. Few chemical methods are at present in general use, and of these only the use of mineral oils for carrots is considered to be really satisfactory by growers. [For very similar article see *H.A.*, 24: 2599.]

3753. Pengelly, R.
**Chemical weed control in horticultural crops.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 66-71.

A chart is given showing the tolerance of 9 vegetables to 8 herbicides applied pre-emergence at 3 or 4 rates each. Pre-emergence, post-emergence and post-harvest applications were made to asparagus. The crop was tolerant to all pre- and post-emergence treatments and the post-harvest plots are being observed for any possible delayed harmful effects. The degree of weed control obtained by the 3 methods of treatment is discussed. In pre-emergence applications to onions, NIX at 8 lb. per acre gave the most satisfactory weed control without causing serious crop damage. Onions were killed by pre-emergence sprays of DNBP, but were tolerant of the material at the 2 to 3 leaf stage. TCA at 25 to 100 lb. per acre severely damaged raspberries, but at 10 lb. per acre caused only temporary injury to strawberries. Newly planted strawberries were damaged by Crag Herbicide 1 at 1, 2 and 4 lb. per acre. In gladioli pre-emergence applications of DNOC gave very good weed control without crop damage.

3754. van Staalduine, D.
Selectieve onkruidbestrijding in schermbloemigen. (**Selective weed control in the umbelliferous crops.**) [English summary ¼ p.]
*Meded. Dir. Tuinb.*, 1954, **17**: 499-512, bibl. 18, illus.

Experiments have been continued over several years to develop an oil weedkiller for umbelliferous crops, and Shell Weedkiller W has been produced. The spray applied at 100 c.c./sq. m. gave satisfactory weed control, although where much *Matricaria inodora* and *Senecio vulgaris* was present 150 c.c./sq. m. was a more satisfactory rate. Celery and carrots under glass may be sprayed on germinating, and celery may also be sprayed at the cotyledon stage. Spraying the 2 to 4 leaf stage is best for carrots, parsley, celeriac and self-blanching celery, and the 2-leaf stage for herbs. Good weather conditions for spraying are dull, with a fairly low temperature and high relative humidity. No after-effect was apparent on yield or taste, or on succeeding crops.

3755. Ferguson, W., and Jasmin, J. J.
**Weed control in table beets and spinach with endothal and other herbicides.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 99-101.

In an experiment in Ontario pre-emergence application of Endothal-3003 at 2·5 gal. (3 U.S. gal.) in 45 gal. per acre gave the best weed control in both table beets and spinach without causing any crop damage.

3756. Leefe, J. S.
**Pre-emergence weed control in peas and other crops in the Annapolis valley area of Nova Scotia.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 102-7.

At Kentville, N.S., 12 herbicides were tested for pre- and post-emergence weeding in peas. As a pre-emergence treatment, the amine salt of dinitro-o-sec-butyl phenol (Premerge) at 4 lb. per acre was found most satisfactory. In post-emergence applications Premerge at 1 lb. and ammonium dinitro-o-sec-butyl phenol (Dow Selective) at 6 and 12 oz. per acre were about equally effective. Pre-emergence applications of Premerge also gave very good weed control in string beans.

3757. Seely, C. I.
**Weed control in peas with herbicides.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 17-21.

In trials in Idaho, sodium-K-1131 (sodium dinitro-ortho-secondary-butyl phenate), applied at 2, 3 and 4 qt. per acre in 20 gal., was the most satisfactory material tested for the control of broad-leaved weeds in peas. Of the commercially available materials, ammonium DNOSBP gave the best results. For control of wild oats 4 lb. of IPC per acre, applied as a spray any time during the 10-day period preceding sowing, is recommended.

---

* Identity said to be doubtful. ? couch.—Ed.

3758. STOUT, G. L., AND WAGNON, H. K.
**Branched broomrape, *Orobanche ramosa* L., a pest of tomato and certain other crops.**
*Bull. Calif. Dep. Agric.*, 1953, **42**: 45-51, bibl. 11, illus.

This parasite occurs on tomato, tobacco and hemp (*Cannabis sativa*), as well as on many weeds in California. The injury to tomatoes is first apparent after the blossom and early green fruit stage; it causes stunting and leaf wilting and may seriously reduce yields. Orobanche seeds are spread in flood or irrigation water or in the soil. There is as yet no satisfactory control.

### *Noted.*

3759.

a ANDREWS, F. W., AND ANDREW, W.
**Weeds of the Gezira scheme.**
*Bull. Sudan Minist. Agric.* **13,** 1954, pp. 66, illus.
Very clear line illustrations with brief descriptions of 56 plants.

b ARMSTRONG, J. M.
**Some recent developments in weed control equipment.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 120-2.

c BOHMONT, D. W., AND EDWARDS, C. R.
**List of common Wyoming weeds.**
*Mimeo. Circ. Wyo. agric. Exp. Stat.* **10,** 1952, pp. 19.
134 weeds listed.

d COBB, R. D.
**The identification of seed of the dodder, *Cuscuta australis* R. Brown.**
*Bull. Calif. Dep. Agric.*, 1954, **43**: 23-4, illus.

e DAWSON, R. B.
**The control of weeds in turf.**
*J. Sports Turf Res. Inst.*, 1953, **8**: 261-8.
All aspects surveyed. [See also *H.A.*, 24: 394.]

f FERGUSON, W., AND JASMIN, J. J.
**Weed control in horticultural crops; progress report.**
*Proc. 7th Mtg east Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 168-72.
23 herbicides with notes on use.

g FREED, V. H.
**IPC and chloro IPC as representative carbamates as herbicides.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 21-7, bibl. 42.

h GREEN, K. R., AND GARDENER, J.
**Species of *Xanthium* in New South Wales.**
*Agric. Gaz. N.S.W.*, 1954, **65**: 259-60, illus.
*X. spinosum, ambrosioides, chinense, californicum* and *italicum*.

i HANCE, F. E.
**Preparation of low-volatile esters of 2,4,5-T for weed control in Hawaii.**
*J. agric. Food Chem.*, 1954, **2**: 738.

j HODGSON, J. M.
**Control of white top (*Cardaria draba*) by combined chemical, cropping, and tillage methods.**
*Proc. 13th west. Weed Control Conf.*, Reno, Nev., 1952, pp. 9-12.

k MUENSCHER, W. C., AND SCHUMACHER, G. J.
**List of weeds of New York.**
*Ext. Bull. Cornell agric. Exp. Stat.* **891,** 1953, pp. 16.
413 weeds listed.

l PEARCE, D. A.
**A progress report on IPC and chloro IPC.**
*Proc. 7th Mtg east. Sect. nat. Weed Cttee 1953*, Kemptville, Ont., 1954, pp. 117-20.

m REPP, G.
Zur Kenntnis der Selektivwirkungen von 2,4-D Verbindungen. II. Mitteilung. 2,4-D-Wirkungen auf Wasserhaushalt und Trokkensubstanzgewicht. (**The selective action of 2,4-D compounds. II. The effects of 2,4-D on water balance and weight of dry matter in plants.**) [English summary 11 lines.]
*PflSch. Ber. Wien*, 1954, **12**: 181-8, bibl. 6.
For Part I see *Ibidem*, 1952, 9: 161-81, bibl. 33.

n ROCHECOUSTE, E.
**Practical aspects of chemical weed control in sugar-cane fields in Mauritius.**
*Sugar J.*, 1954, **16** (11): 26, 28, 39.
Covers the same ground as the latter part of paper abstracted in *H.A.*, 24: 2548.

o SHARIF EL DIN, H., AND JONES, K. W.
**Copper sulphate as an aquatic herbicide.**
*Nature*, 1954, **174**: 187.
Possibilities are being tested in the Sudan.

p TUCKETT, A. J., AND WARD, R. K.
**Ragwort control.**
*Proc. 6th N.Z. Weed Control Conf. 1953*, Massey agric. Coll., pp. 59-65, bibl. 7.
Mainly with 2,4-D.

# VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE.

### *General.*

(*See also* 3324, 3325, 3330, 3337, 3343, 3344, 3368, 3371, 3413, 3416, 3419, 3426, 3430, 3435, 3438, 3443p, 3575, 3586, 3588, 3660, 3667, 3681, 3697, 3781, 3955d, e, 3956g, l, m, 4135, 4456, 4457, 4463, 4472, 4474, 4478, 4481, 4488, 4490, 4491.)

3760. National Institute of Agricultural Botany.
*Thirty-fourth Report and Accounts NIAB, Cambridge, for 1953,* pp. 48.

Notes on vegetable trials concern the following: Brussels sprouts varieties; broccoli varieties for yield and resistance to cauliflower mosaic; winter cabbage spacing; red cabbage—the Cambridge Red cabbage showed to advantage against other varieties; savoys, type selection; autumn cauliflower varieties; onion varieties.

3761. Odland, M. L., and Noll, C. J.
**Vegetable variety trials—1953 [in Pennsylvania].**
*Progr. Rep. Pa agric. Exp. Stat.* **114,** 1954, pp. 8.

Lima and snap beans, beets, broccoli, cabbage, carrots, peas, peppers, sweet corn and tomatoes.

3762. Lamm, R., Tometorp, G., and Åvall, H.
Klassificerande sort- och stamförsök med köksväxter 1951-1954. (**Vegetable variety trials in Sweden 1951-54.**) [English summary 2 pp.]
*Medd. Trädgårdsförs. Malmö* **86,** 1954, pp. 44, bibl. 13.
Botany, Cambridge.

The new vegetable varieties and strains officially tested at Alnarp and other experiment stations and adjudged "first class" included several types of dwarf bean, dill, radish, sprouts and spinach.

3763. Jasmin, J.-J.
Les hybrides en culture maraîchère. (**Hybrids in market gardening.**)
*Agriculture, Quebec,* 1954, **9** (3): 17-19, illus.

Notes on first-cross hybrid varieties of sweet corn, onion, cucurbits, tomato, eggplant, pepper and cabbage. —Centr. exp. Fm, Ottawa.

3764. Sneep, J.
Perspectieven van recent veredelingswerk bij enige kool- en bladgewassen. (**Prospects of recent breeding work on some brassicas and other leafy vegetables.** [English summary ¼ p.]
*Meded. Inst. Vered. Tuinbouwgew.* **54,** 1953, pp. 19-28, illus.

The possibilities offered by selfing are discussed for cauliflower, sprouts, endive, chicory and asparagus. Inbreeding, which leads to less serious loss of vigour than is often supposed, may be a means of reducing the heterogeneity of asparagus. Self-fertilization of cross pollinators is an intermediate stage to be followed by making new combinations of lines from which undesirable characters have been removed. The author refers to the breeding of lettuce varieties resistant to downy mildew and those not transmitting *Lactuca* virus 1 by seed.

3765. Todd, B. J., and Evans, C. D.
**Production and market facilities for commercial vegetables in South Carolina.**
*Circ. S.C. agric. Exp. Stat.* **91,** 1953, pp. 23, maps.

The principal commercial vegetable crops of South Carolina are cabbage, melons, sweet corn, cucumber, french and lima beans, squash and tomatoes. They are chiefly marketed on the eastern seaboard of the U.S.A. Subjects discussed are markets, marketing seasons, methods and facilities, acreage, relationship to other crops, and economics.

3766. U.S. Department of Agriculture, Bureau of Agricultural Economics.
**Vegetables for commercial processing.**
*Statist. Bull. U.S. Dep. Agric.* **132,** 1953, pp. 108, 30 c.

Tables of revised estimates of acreage, yield per acre, production, seasonal average price to growers, and values of vegetables for commercial processing for 1918–50 inclusive.

3767. Astrego, J. J.
Bloeiend land- en tuinbouwbedrij in voormalig hoogveengebied. (**Flourishing agriculture and horticulture in a former bog peat area.** [English summary ⅓ p.]
*Meded. Dir. Tuinb.*, 1954, **17**: 519-24, illus.

Peat from the Wiesmoor district of East Friesian Germany is used by an electric power station. The excavated peat area has been reclaimed for horticultural use, and the waste products from the station provide heating and irrigation water for a nearby glasshouse nursery used mainly for growing tomatoes and cucumbers.

3768. (Asami, Y.)
**Ecological studies on vegetables [and strawberries].** [Japanese with English summaries.]
*Res. Rep. Japan Minist. Educ.* **17,** 1954, pp. 75, bibls., illus.

This report contains 7 papers on cucumber, onion, chinese cabbage, kidney bean, cruciferous greens and turnips, and strawberries.*

3769. Adamson, R. M.
**Experimental results in vegetable seed production.**
*Mimeo. Saanichton exp. Stat., B.C.*, **150,** 1954, pp. 16, illus.

The results are given of cultural experiments with different seed crops carried out in British Columbia. *Broad beans:* February was the best time for sowing, earlier sowings were susceptible to frost, and later sowings gave reduced yields. *Runner beans:* in an attempt to reduce staking costs, plants were grown unstaked, but they gave poor seed yields. *Beet:* roots could survive winter temperatures of 10° F. in shallow field pits when covered by 6 inches of soil; roots were successfully stored in well-drained pits 15 inches deep; June sowings were the most satisfactory, moisture being the limiting factor with July sowings. *Cabbage:* in general mid- to late-summer sowings were most satisfactory, but quick bolting varieties may be sown later. *Cauliflower:* where possible, sowing in boxes in late September or early October and growing seedlings slowly in a cold greenhouse is suggested, with pricking out at the end of February and transplanting to the field in early April. *Leek:* the heaviest seed yields were from plots with 2-inch spacings; high seed yields were possible from plants sown early and allowed to mature where sown. *Lettuce:* mutilation of the head of slow-bolting varieties hastened seed production; plants allowed to show signs of shattering before cutting gave 16% more seed; seed chilling before sowing markedly influenced rate of maturity. *Turnip:* the second half of August was the best sowing time for summer turnip seed production.

---

* See also separate abstracts.

3770. Dlinka, A. D., Skripov, I. V., and Dvornikova, Z. V.
**Trials on planting and sowing onion, bean and vegetable seed plants in groups on the square.** [Russian.]
*Sad i Ogorod*, 1954, No. 4, pp. 11-15, illus.

Three brief papers on the advantages of planting vegetables in groups on the square, with clear illustrations showing the principle of this method of spacing.

3771. Newson, D. W.
**Some studies on the effects of the incorporation of certain growth stimulants in pelleted seed on germination and development of the seedlings.**
*Diss. Abstr.*, 1954, **14**: 903, being *Publ.* 8071 of 54 pp.

Arasan, cupric oxide, iron chlorophyll, bone char, superphosphate, the calcium salt of keto succinic acid, sulphuric acid, potassium nitrate and dried blood were incorporated singly or in combination in the pellets. The pelleting consisted of building up the seed to the desired size with a coating material of 70% minco clay and 30% cellite, and incorporating one or more of the various substances named above. Pelleting was found not to affect germination, seedling development, earliness or yield. It should be economically sound from the standpoint of precision planting.

3772. Romshe, F. A.
**Studies of plant production methods for vegetable crops: cabbage, tomatoes, onions, melons and cucumbers.**
*Bull. Okla agric. Exp. Stat.* **B-241,** 1954, pp. 14.

Cabbage plants started in a greenhouse in Oklahoma produced more than twice as much total yield, and more than four times as much early yield as plants started in a field farther south, when both groups were subsequently planted out in Oklahoma. Cabbage plants grown in a hotbed were of superior quality to those grown in a cold frame. Tomato plants started in an Oklahoma greenhouse produced about 50% more total yield and an earlier crop than plants started outside farther south; both groups were subsequently planted outside. Yields of tomatoes were reduced when less than 4 square inches of seed bed was allowed per plant. Onions of the Yellow Sweet Spanish variety started in Texas and transplanted in Oklahoma gave higher yields than those started in a cold frame. Muskmelons, watermelons and cucumbers were successfully started in a greenhouse and transplanted outside.

3773. Janes, B. E.
**Vegetable crop rotation studies on Connecticut soils.**
*Progr. Rep. Storrs agric. Exp. Stat.* **4,** 1954, pp. 10, illus.

A study was made of the residual effect of several crop rotations as influenced by cover crops of vetch and rye, using beet, lettuce, onion and tomato as test crops. Sweet corn had a depressing effect on succeeding crops of onion, lettuce and tomato; it delayed germination and slowed early growth of beet, but did not depress the yield. On the soils previously planted to vetch, all crops were darker green in colour, indicating more available N. The beet yield was higher on soils previously planted to vetch; lettuce showed less tip burn under these conditions. Tomato and onion yields were not greatly affected by a previous crop of vetch. Further studies on the harmful effect of sweet corn are being continued.

3774. Geisenheim.
Abdeckversuche zu Tomaten, Gurken, Zwiebeln, Möhren und Buschbohnen. (**Mulching trials with tomatoes, cucumbers, onions, carrots and dwarf beans.**)
*Ber. Lehr- u. ForschAnst. Geisenheim/Rhein 1952/53*, p. 37.

In 1952, mulching with a 10 cm. layer of hay increased the yields of tomatoes by 15% and of cucumbers by 20%. The structure of the covered soil (sandy loam) remained unaffected by sprinkler irrigation, while the control plots showed panning before the plants were large enough to afford protection. Onions, carrots and dwarf beans did not derive any benefit from mulching.

3775. Bielka, R., and Hildebrandt, H. J.
Bodenbedeckungsversuche im Gemüsebau. (**Mulching vegetables.**)
*Arch. Gartenb.*, 1954, **2**: 161-71, bibl. 9.

In one year's preliminary trials a 3 cm. straw cover put down after planting increased yields of tomatoes by 47–73%, of cucumbers by 29–34% and of celeriac by 10–26%, according to the time of fertilizer application. Differences in earliness and quality were not significant, with the exception of celeriac where the improvement in quality of the mulched plots amounted to 30%. The mulching of kohl rabi with [spent?] mushroom compost produced an increase in yield of 32–55%. Data are given on the effect of a cover on the soil fauna, including earthworms, and on the weight of roots at 3 depths. The beneficial action of mulching is partly attributed to higher $CO_2$ production due to the improved aeration of soils containing a rich fauna and to the better development of the root system in the absence of cultivation.—Karl-Marx-Univ., Leipzig.

3776. Haworth, F., and Nelder, J. A.
**The effect of "Krilium" on the yield of certain vegetable crops. I.**
*A.R. nat. Veg. Res. Stat. Wellesbourne for 1953*, 1954, pp. 30-5.

On the soil type at Wellesbourne (Newport series—gravelly phase) the application of krilium caused no spectacular increase in yield of peas, spring onions, lettuce or white turnips.

3777. Miller, J. G., and Browning, H. A.
**Fertilisers in the market garden programme.**
*N.Z. J. Agric.*, 1954, **88**: 537.

Preliminary results in the first 3 years of a long-term manurial trial at Hamilton, N.Z., on market crops are given. The soil is a clay loam usually responding to phosphates, and a 3-year rotation is being used with potatoes and Succession cabbage, followed by French beans and spring cabbage, followed by spinach beet and lupins. Applications of nitrate of soda at 1 cwt. and 5 cwt. per acre were compared with dried blood at equivalent rates of N, and applications of superphosphate at 3 cwt. and 10 cwt. per acre were compared with bonedust containing equivalent phosphate. Results showed that spinach beet gave a pronounced response to the high P rate, and in 1 year the high N rate also gave a yield increase, nitrate of soda being slightly better than dried blood. French beans did not show consistent results, although there was a slight tendency for bonedust to give an earlier picking than superphosphate. High rates of P and N gave increased early harvests of Enfield Market cabbage; superphosphate was slightly better than bonedust, and dried blood generally better than the nitrate, although on plots receiving superphosphate the difference was reversed. High P rates gave increased yields of Succession cabbage throughout the trial.

3778. Dios Vidal, R., and Albareda Herrera, J. M.
Análisis foliar. I. Aplicación del análisis químico de la hoja y del método de diagnosis visual a la investigación de deficiencias minerales en relación con los suelos de cultivo. (**Leaf analysis. I. Application of chemical analysis and visual diagnosis to the study of mineral deficiencies in the soil.**)
[English summary $\frac{3}{4}$ p.]
*An. Edaf. Fis. veg. Madrid*, 1954, **13**: 339-418, bibl. 109, illus.

The elements N, P, K, Ca, Mg, Fe and Mn were studied in vegetables, strawberries and fruit trees, namely apple, pear and plum, on acid (pH 5·5–6·3) and calcareous (pH 7·1–7·4) soils in Spain in 1951 and 1952. The results are discussed in considerable detail.

3779. Yankovitch, L.
Résistance aux chlorures des plantes cultivées. II. Betteraves potagères, radis, navet, choux et fenouil. Tomate "Marmande" d'Algérie. (**Resistance of cultivated plants to chlorides. II. Garden beet, radish, turnip, cabbage, fennel and the Marmande tomato of Algeria.**)
*Ann. Serv. bot. agron. Tunis*, 1951, **24**: 33-64, bibl. 5 [received 1954].

A detailed account is given of experiments made in 1950/51 to determine the effect of sodium chloride on a calcareous clay and on the transpiration and physiology of some cool season vegetables, and of the Marmande tomato, a hot season crop. Savoy and beetroot showed resistance above the average and tomato showed average resistance. Radish and turnip benefited from small amounts of salt but their limit of resistance was low because they cannot stand salt water in contact with the collar and because they easily accumulate salt in toxic quantities. Florentine fennel was very susceptible.

3780. Lehmann, E., and Grütz, W.
Zur Methodik der Oxalsäurebestimmung in Pflanzen. (**Methods of determining oxalic acid in plants.**)
*Z. PflErnähr. Düng.*, 1953, **61**: 77-86, bibl. 9.

A new method of determining the total oxalic acid content of plants has been developed, its accuracy being within 0·3%. The values tabulated for many vegetables show that the oxalic acid content of spinach and rhubarb leaves and of tomato fruits is much higher than has hitherto been estimated.—Tech. Univ., Berlin-Charlottenburg.

3781. Intengan, C. L., and others.
**Composition of Philippine foods. I.**
*Philipp. J. Sci.*, 1953, **82**: 227-52, bibl. 34.

Results of the analyses of 108 samples of Philippine foods for contents of moisture, ether extract, nitrogen, crude fiber, ash, calcium, phosphorus, iron, carotene, thiamine, riboflavin, niacin and ascorbic acid are presented. These samples included 28 fruits, 32 leafy vegetables, 22 vegetable fruits and legumes, 2 vegetable flowers, 7 roots, bulbs and tubers, and 17 miscellaneous items. Data obtained from the samples showed that many of the foods had a relatively high content of one or more nutrients. Outstanding sources for each nutrient are given. [Authors' summary.]—Inst. Nutr., Manila.

3782. Antoniani, C., Federico, L., and Valle, T.
Contributi alla conoscenza del contenuto vitaminico dei prodotti agrari e d'uso agrario. Nota VI. Contenuto in vitamina PP degli ortaggi e delle frutta. (**The vitamin content of agricultural products. VI. Content of vitamin PP in vegetables and fruits.**)
[English summary 2 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 919-27, bibl. 38.

The vitamin PP contents, fresh and dry weight, of a number of vegetables and fruits are given. These were calculated by H. Moor's method* at the Milan Refrigeration Research Station.

3783. C.S.I.R.O., Australia.
**Microbiology.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 20-1.

*Antibiotic investigations:* comparative *in vitro* tests showed that streptomycin and aureomycin were more effective than bacitracin, chloromycetin, terramycin and penicillin in inhibiting growth of *Corynebacterium michiganense*, *Xanthomonas vesicatorium*, *X. phaseoli*, *X. campestris*, *Pseudomonas medicaginis* and *P. syringae*. Studies *in vivo* of streptomycin against bacterial canker of tomato showed that the antibiotic was readily absorbed via the roots, and is very stable in the leaf tissue, where it becomes fixed and is not transferred to young growing leaves. Treatment with 10 p.p.m. streptomycin for 7 days, starting within 72 hours of inoculation, prevented wilting, but the pathogen was not killed.

---

* *Mitt. Lebensm. Hyg. Berne* 1949, **15**: 402

3784. Nickell, L. G.
**Antibiotics in the growth of plants.**
*Antibiot. and Chemother.*, 1953, **3** (4): 449-59, illus., from abstr. in *Biol. Abstr., Sect. D*, 1954, **28**, No. 11958.

The effects of antibiotics on vegetables and other plants are discussed. The antibiotics in question are streptomycin, neomycin, circulin, terramycin, penicillin, thiolutin and bacitracin.

3785. C.S.I.R.O., Australia.
**Insects and viruses.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, p. 70.

Further data on the leafhopper vector (*Austrogallia torrida*) of rugose leaf curl are given. The virus is transmitted by the female to about 40% of her progeny. Rugose leaf curl, a virus disease of carrot and tomato, has been transmitted to 16 species of 8 families.

3786. Neumann, P., and Schaffnit, E.
Über den Einfluss des Bodens, insbesondere von Torf und Moorboden, auf die Infektion von Keimlingen landwirtschaftlicher und gärtnerischer Kulturpflanzen durch parasitäre Bodenpilze. (**The influence of soil, especially of peat and fen soil, on the infection of seedlings of agricultural and horticultural plants by parasitic soil fungi.)**
*Z. PflBau PflSchutz*, 1953, **4**: 241-51, bibl. 18.

The horticultural plants considered in this review include cauliflower, cabbage, radish, pea, tomato, cucumber and tobacco.

3787. Stitt, L. L.
**Garden springtail investigations.**
*J. econ. Ent.*, 1954, **47**: 173-4, bibl. 4.

During recent years garden springtail, *Bourletiella hortensis*, has damaged spinach, beans, cucumbers and squash in Washington. In plot tests on spinach, 1% parathion and 4% malathion dusts gave good control of the pest for 10 to 14 days. Residue analyses are given.

3788. Hartzell, A., Storrs, E. E., and Burchfield, H. P.
**Comparison of chemical and bioassay methods for the determination of traces of chlordane and heptachlor in food crops.**
*Contr. Boyce Thompson Inst.*, 1954, **17**: 383-96, bibl. 6.

Samples of potatoes, yams, cabbages, onions, carrots, corn and turnips, which had been treated with insecticide under field conditions, were analysed for chlordane and heptachlor by chemical and bioassay methods. The chemical analyses were made by the methods of Davidow, and Polen and Silverman, while the bioassay results were obtained by the mosquito larvae technique of Burchfield, Hilchey and Storrs. Average results obtained by the 2 methods agreed closely for samples containing chlordane, but the bioassay method gave lower results on the heptachlor samples because of the masking effect of plant lipids present in the extracts. [From authors' summary.]

## *Artichoke, globe.*

3789. Thermes, R., Delmas, H.-G., and Cessac, M.
Premières études sur la lutte contre la noctuelle de l'artichaut en Rousillon. **(Preliminary studies on the control of the night moth of artichokes in Rousillon.)**
*C.R. Acad. Agric. Fr.*, 1954, **40**: 344-8, bibl. 1.

Studies were made on the biology of *Hydraecia xanthenes*, the caterpillar of which burrows into the flower stem of globe artichokes. In the field promising control of the caterpillar was given by 2% dieldrin dust and 10% chlordane dust applied 4 times during January and February.

3790. Lange, W. H., Sciaroni, R. H., and Greathead, A. S.
**Artichoke plume moth damage.**
*Calif. Agric.*, 1954, **8** (7): 7-8, 12, illus.

The life history is described of the [globe] artichoke plume moth (*Platyptilia carduidactyla*) which has recently caused severe losses to Californian growers. The practice of staggering plantings, in order to harvest artichokes at different times of the year, affords a continuous supply of food for this pest. Natural enemies are not very efficient under field conditions. Chemical control of the summer and fall broods can be obtained by dusts of 2% parathion with 5% DDT. Adequate sanitation and cultural practices, including the destruction of all infected plant material and of *Cirsium* thistles, will help to prevent severe attacks.

3791. Delanoue, P., and Soures, B.
Contribution à l'étude locale de *Lepidechidna acharnias* Meyr., microlépidoptère de l'artichaut. Morphologie externe, biologie, recherche de methodes de lutte. **(*Lepidechidna acharnias*, a lepidopterous pest of the [globe] artichoke. Morphology, biology and control experiments.)**
*Ann. Serv. bot. agron. Tunis*, 1951, **24**: 1-20, bibl. 12, illus. [received 1954].

DDT and BHC sprays gave promising results in control experiments. It is thought that 4–5 treatments between late November and the end of December would give good preventive control. Good curative control was obtained by 2 treatments in mid-December and early January, especially when the head was opened by hand. Other control measures are growing the crop as an annual, digging in the residue and concentrating on the production of either early or late crops.

## *Asparagus.*

3792. Johnson, R. I.
**Experiments with green and white asparagus.**
*Agric. Gaz. N.S.W.*, 1954, **65**: 196.

Experiments carried out during 4 years in New South Wales showed that in general green asparagus production compared favourably with that of white asparagus. Green asparagus showed a tendency to give a slightly higher yield and took less time to harvest, although white asparagus gave a higher proportion of marketable spurs.

3793. HOPP, R.
**Growing asparagus in Vermont.**
*Pamphl. Vt agric. Exp. Stat.* **30,** 1954, pp. 11, bibl. 1, illus.

Notes are given on varieties, planting material, soil, establishment, cultural practices including the use of herbicides (cyanamide and CMU), and pests and diseases.

3794. RAYMOND, C. B., AND OTHERS.
**Asparagus.**
*Cornell Ext. Bull.* **909,** 1954, pp. 15, illus.

Aspects covered by this bulletin include soil and soil preparation, varieties, establishment, manuring, weed control, harvesting and marketing, and pests and diseases. Chemicals that may be used at stated concentrations for weed control include cyanamide, salt, 2,4-D, Crag-1, dinitros, PCP and CMU. A new type of asparagus knife for cutting spears at or just above ground level is illustrated.

3795. JUNGES, W., AND ERNST, E.
Zur Frage der Spargelmüdigkeit der Böden des Weinböhlaer Anbaugebietes. **(The problem of sickness of asparagus soils in the Weinböhla district, Eastern Germany.)**
*Arch. Gartenb.*, 1954, **2**: 132-43, bibl. 14, illus.

A marked reduction in yield from the old-established asparagus plantations in the Weinböhla area near Dresden was shown to be due to the widespread contamination of the soil by *Fusarium culmorum.* As there seems to be no hope of controlling the disease, affected growers are advised to abandon asparagus culture.—Inst. Gartenb., Dresden-Pillnitz.

3796. BERAHA, L.
**An investigation on the environmental factors affecting the development of *Puccinia asparagi* DC.**
*Diss. Abstr.*, 1954, **14**: 900, being *Publ.* 7828 of 94 pp.

Temperature and moisture conditions are very important factors in infection and development of the asparagus rust fungus. Young succulent shoots are more susceptible than the mature parts. The view that different physiologic races of the fungus account for the loss of supposed resistance to it in Washington strains is not supported by the evidence. [See also next abstract.]

3797. BERAHA, L.
**Studies on *Puccinia asparagi* and its relation to *Allium* spp.**
From abstr. in *Phytopathology*, 1954, **44**: 388.

The uniform but distinct types of reaction obtained when *Asparagus* spp. and *Allium* spp. were inoculated with *Puccinia asparagi* support the contention that physiological races of the rust fungus, if present, do not account for the loss of supposed resistance in the Washington strains of asparagus.

### *Brassicas.*

(*See also* 3383, 3422, 3522, 3903, 3955i, o, s, z.)

3798. ITO, H., AND OTHERS.
**Ecological studies on chinese cabbage varieties.** [Japanese, with English summary 10 lines.]
*Res. Rep. Japan Minist. Educ.* **17,** 1954, pp. 33-8, bibl. 3.

A leafy and a non-leafy type are differentiated. Heads form after about 45 days and continue to develop at temperatures above 10–15° C. depending on variety.

3799. VERKERK, K.
**The influence of low temperature on flower initiation and stem-elongation in brussels sprouts.**
*Proc. kon. Akad. Wetensch. Series C*, 1954, **57**: 339-46, bibl. 15, reprinted as *Publ. Lab. TuinPl. Wageningen* **121.**

The effect of cold on adult brussels sprout plants was studied. In the first series of experiments, plants which had been growing at a temperature too high for flower initiation were kept for 10 weeks at temperatures between 4° and 14° C. Microscopical dissection of the growing tips showed the first signs of a generative stage after 4 weeks at 7° C. and after 5 weeks at 4° C. and at 10° C.; plants at 14° C. did not flower. In the second series of experiments vegetative plants were kept at 4°, 7°, 10° or 14° C. for 5, 7 or 9 weeks; both before and after treatment plants were kept at 23° C. between 8 a.m. and 4 p.m., and at 17° C. for the rest of the day. Measurement of the average growth length during and after treatments showed that faster growing plants flowered earlier than slower growing ones; longer cold treatment at 4° and 7° C. was followed by faster growth, although treatment for 9 weeks seemed to be approaching the optimum for this effect. Temperatures of 10° and 14° C. were too high for rapid extension growth.

3800. ROLL-HANSEN, J.
Vegetativ formering av kvitkål for frøavl. **(The vegetative propagation of cabbage for seed production.)**
*Norsk Hagetid*, 1954, **70**: 79-81, illus.

Cabbage is the only type of vegetable of which many Norwegian varieties have been bred. Work at Kvithamar Research Station on the propagation of cabbage by cuttings is described.

3801. SINGLETON, G.
**Some factors affecting the yield of broccoli on Scranton fine sand in Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 97-9.

The yield of broccoli on Scranton fine sand was increased by using dairy manure composted with acid muck and calcium cyanamide. The quality of the heads was kept high by careful harvesting so that primary side shoots were continually produced.

3802. TRULEVIČ, V. K.
**Foliar nutrition of cabbage.** [Russian.]
*Sad i Ogorod*, 1954, No. 6, pp. 26-7.

Results are presented showing that foliar applications of ammonium nitrate to the cabbage variety Nomer pervyĭ [No. 1] gave larger yield increases than soil applications. It is recommended that in the forest-tundra and taiga zones of the Far North 1·5% ammonium nitrate should be sprayed on cabbage leaves 15–20 days after planting, and the treatment should be repeated 5–6 times at 7–10 day intervals.

3803. Shepherd, R. W.
**Manuring brussels sprouts.**
*Agriculture, London*, 1954, **61**: 115-17.

Trials were carried out over 4 years at the Norfolk Agricultural Station, Sprowston, to determine the effect of various fertilizers and combinations of fertilizers on the yield and quality of brussels sprouts. The variety used was Rous Lench, and the soil was a light medium loam, with the phosphate content medium to medium-high, and available potash low to very low. Results showed that N had the greatest effect on yield, an application of 3 to 4 cwt. of sulphate of ammonia per acre before transplanting increasing the yield of saleable sprouts by 10 cwt. per acre. One ton of soot (4% N) per acre increased the yield of saleable sprouts by 7½ cwt. per acre. Top-dressing with N fertilizer some time after planting did not increase the yield. Inorganic fertilizers and soot both affected sprout quality, increase in yield being accompanied by an increase in "blows". Applications of 4 cwt. of muriate and of sulphate of potash gave equal increases in yields of saleable sprouts. On this soil phosphate was shown to be relatively unimportant. The effects of K and N manuring were most marked at the first picking; plants with a lack of P showed a marked decline in yield at the second picking.

3804. Lent, J. M., and Scarchuk, J.
**Effect of boron on cabbage and cauliflower.**
*Prog. Rep. Storrs agric. Exp. Stat.* **1,** 1954, pp. 6.

Experiments were carried out for 4 years in Connecticut on the effect of boron on cabbage, variety Golden Acre, and cauliflower, variety Super Snowball. Results showed that there was a build-up of boron on those plots which received repeated borax applications. The first application of 80 lb./acre of borax gave increased yields for both spring cabbage and cauliflower, but fall cabbage and cauliflower showed no difference in yield, and with the same rate applied for a second year there was no difference in yield for either crop. Borax applied at 160 lb./acre had no effect on cauliflower yield but depressed the yield for spring cabbage. There was no difference in yield as between moderately-limed and heavily-limed plots at the various rates of borax for either crop. The external appearance of the crops was normal, except for the spring cabbage at the 160 lb. rate which showed some marginal leaf scorch.

3805. Plant, W.
**The molybdenum content of some brassicae and lettuce crops in acid soils.**
*Trans. Joint Mtg Commissions II and IV int. Soc. Soil Sci.*, July 1952, pp. 176, 177.

Includes a table showing the reaction to Mo deficiency and the Mo content of leaves in cauliflower, cabbage, brussels sprout, kale, lettuce and certain other crops, according to whether soil pH is 4·5 or 6·5.

3806. Ducet, G., and Hewitt, E. J.
**Relation of molybdenum status and nitrogen supply to respiration in cauliflower leaves.**
*Nature*, 1954, **173**: 1141-3, bibl. 5.

The results suggest, among other things, that respiratory balance is not greatly disturbed by molybdenum deficiency.—Long Ashton.

3807. Gammon, N., Jr., and others.
**Soil factors affecting molybdenum uptake by cauliflower.**
*Proc. Soil Sci. Soc. Amer.*, 1954, **18**: 302-5, bibl. 22, illus.

Molybdenum deficiency of cauliflower has been observed on the acid flatwood soils of Florida (pH 4·2 to 5·0). It was shown that the conditions in acid, highly fertilized soils limited Mo uptake by the plant. Cauliflower plants, with root systems restricted by transplanting and set in acid soils with low available Mo, soon showed temporary Mo deficiency. With an increase in root growth and dispersion of acidity from the fertilizer, Mo became more accessible to the plant, and deficiency symptoms often disappeared. Corrective measures recommended for Mo deficiency are: the use of less-susceptible varieties, such as Snowball X, liming the soil and the seedbeds, and the use of fewer acid fertilizers, especially in seedbeds.—Fla Agr. Exp. Stat., Gainesville.

3808. Poe, C. F.
**The vitamin $B_1$ content of chinese cabbage.**
**The vitamin A content of chinese cabbage.**
*Ser. Chem. Pharm. Univ. Colo. Stud.* **1,** 1952, pp. 48-52, 53-8, from abstrs in *Biol. Abstr., Sect. D*, 1954, **28,** Nos. 6915 and 6916.

Experiments with white rats showed that *Brassica chinensis* contains a small amount of vitamin $B_1$ and is a fair source of vitamin A.

3809. Patton, M. B., and Green, M. E.
**Cabbage—factors affecting vitamin values and palatability.**
*Res. Bull. Ohio agric. Exp. Stat.* **742,** 1954, pp. 96, bibl. 102.

The content of ascorbic acid in raw and cooked cabbage was investigated. Raw cabbage was shown to be a good source of ascorbic acid, red and purple varieties being particularly high in ascorbic acid. Plants harvested in spring and early summer generally contained more ascorbic acid than those harvested in other seasons; neither fertilizers nor irrigation affected ascorbic acid content.

3810. Bawden, F. C., Hamlyn, B. M. G., and Watson, M. A.
**The distribution of viruses in different leaf tissues and its influence on virus transmission by aphids.**
*Ann. appl. Biol.*, 1954, **41**: 229-39, bibl. 14.

By exposing both surfaces of leaves systemically infected with cabbage black ring spot virus (CBRSV) and henbane mosaic virus to ultra-violet radiation, the infectivity of expressed sap was reduced to about one-fifth. Irradiation probably inactivated virus occurring mainly in the epidermis, thus these viruses probably occur in higher concentrations in epidermal sap than in sap from other cells, which is not the case with tobacco mosaic virus. CBRSV and henbane mosaic virus, normally transmitted most frequently by previously fasted aphids (*Myzus persicae*) feeding on infected leaves for short periods, were only rarely transmitted under these conditions from irradiated leaves. Irradiation had little effect on the proportion of aphids transmitting after long infective feedings. Fasting seemed to increase transmission by increasing the probability that aphids imbibed sap from the epidermis of newly colonized leaves; with longer infective feeding periods the ability to transmit decreased, because the aphids fed from deeper cells containing less virus. Only virus contained in the stylets seemed to be transmitted.

3811. BUHL, C.
Die Überwinterung der Kohlblattlaus (*Brevicoryne brassicae* L.) in dem Kohlanbaugebiet an der Westküste Schleswig-Holsteins. **(The overwintering of the cabbage aphid in the cabbage growing area on the west coast of Schleswig-Holstein.)**
*NachrBl. dtsch. PflSchDienst., Braunschweig*, 1954, **6**: 86-90, bibl. 12.

In Schleswig-Holstein *Brevicoryne brassicae* was found to overwinter on cabbage plants grown for seed. The ideal control of this important virus vector would consist in the concentration of seed production in an area sufficiently remote from other cabbage fields. Where this is impracticable, seed plants and plants overwintering in house gardens and allotments should be treated with systemic insecticides before any winged forms of the aphid appear.—Biol. Bundesanst., Kiel-Kitzeberg.

3812. VAN HOOF, H. A.
Enkele gegevens over de melige koolluis (*Brevicoryne brassicae* L.) in het Geestmerambacht, en zijn bestrijding. **(Data on overwintering and control of cabbage aphis in Holland.)** [English summary $\frac{1}{2}$ p.]
*Tijdschr. PlZiekt.*, 1954, **60**: 131-5, bibl. 2.

The vector of cauliflower mosaic, *Brevicoryne brassicae*, overwinters in the egg stage on seed cabbage plants in the province of North Holland. Trials in this area in 1952 and 1953 showed that parathion did not give satisfactory control of the aphids, owing to the fixation of parathion in the wax layer of the cabbage leaves. Systox at the rate of 0·05%, sprayed both at the beginning and end of June, gave very good results.

3813. BAIN, D. C.
**Blackrot resistance in cabbage.**
From abstr. in *Phytopathology*, 1954, **44**: 331.

Plants from crosses of a resistant inbred Huguenot line with diseased and healthy plants of commercial cabbage varieties did not develop black rot [*Xanthomonas campestris*] symptoms within 3 weeks of inoculation, whereas all the controls succumbed within 10 days. These results indicate that there is a factor (or factors) for black rot resistance in cabbage.

3814. GRIGOROVIČ, A. F.
**Control of cabbage seed pod weevil.** [Russian.]
*Sad i Ororod*, 1954, No. 4, p. 76.

Satisfactory control of *Ceutorrhynchus assimilis* on cabbage seed plants was obtained with 2 applications of BHC as spray or dust.

3815. WRIGHT, D. W.
**The control of cabbage root fly on cauliflower plants raised in pots.**
*A.R. nat. Veg. Res. Stat. Wellesbourne for 1953*, 1954, pp. 21-6, bibl. 1.

Satisfactory control of the cabbage root fly [*Erioischia brassicae*] was obtained on cauliflower varieties Finney's 110 and All the Year Round by applying 0·02% gamma BHC suspension at the rate of $\frac{1}{16}$ pint per potted plant immediately before transplanting. Chlordane and aldrin also gave good results. [See also *H.A.*, 24: 1543.]

3816. WRIGHT, D. W.
**Cabbage root fly [*Erioischia brassicae*].**
*A.R. nat. Veg. Res. Stat. Wellesbourne for 1953*, 1954, pp. 18-19.

Studies on the control of cabbage root fly showed that by preventing its attack on cauliflower in pots an increase of up to 81% in yield was obtained, and on cauliflowers transplanted from nursery beds an increase of 97%. Yield increases of 40% were shown by summer cabbage and autumn cauliflower after preventive treatment. The use of an insecticide on Primo cabbage treated with farmyard manure increased the yield by 44%.

3817. DOBROVSKY, T. M.
**Retarding effect of some insecticides on cabbage seedlings.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 166-8, bibl. 10.

Plots of cabbage seedlings, variety Medium Copenhagen Resistant, treated with DDT, chlordane and parathion produced fewer "large" seedlings than untreated plots. DDT appeared to have the least retarding effect on seedling development, chlordane came next and parathion had the greatest effect.

3818. FRANSEN, J. J., AND KERSSEN, M. C.
Werking van parathionresidu's op diverse koolsoorten. **(The activity of parathion residues on different kinds of cabbage.)** [English summary 11 lines.]
*Meded. LandbHoogesch. en Opzoek. Stat. v.d. Staat, Gent*, 1953, **18**: 422-38, bibl. 2, reprinted as *Meded. PlZiekt. Dienst* **62,** 1953.

A description is given of the biological method used to test the surface activity of parathion residues on leaves of chinese and red cabbage. Experimental results showed that after immersion of the leaves the spray liquid ran off those with a thick wax layer. Parathion was absorbed by the wax layer, particularly by those leaves with a thick wax layer, which reduced the effectiveness of the spray residue as a contact spray. As the absorned parathion appeared to remain in the wax layer, its activity as a stomach poison was increased. Low volume and high volume sprays were equally effective, provided that the same amount of parathion per unit area was used.

3819. SMITH, W. L., JR., AND HARDENBURG, R. E.
**Antibiotic and other chemical dips reduce discoloration of packaged cole slaw.**
From abstr. in *Phytopathology*, 1954, **44**: 389-90.

Marketability of unrefrigerated cole slaw is limited because it usually darkens appreciably in one day.

Tests to reduce discoloration consisted of dipping freshly cut slaw in chemical solutions for 20 or 60 seconds and then storing it in ventilated cellophane packages for 3 days at 70° F. Only 3 of the 95 chemicals tested consistently reduced discoloration. Slaw was saleable for 3 days, 2 days and more than 1 day after treatment with 0·1% streptomycin sulphate, 1·0% $NaHCO_3$ and 1·0% NaCl respectively.

### *Celery.*

3820. Wittwer, S. H., Jackson, H., and Watson, D. P.
**Control of seedstalk development in celery by maleic hydrazide.**
*Amer. J. Bot.*, 1954, **41**: 435-9, bibl. 27, illus.

Cornell 19 celery plants were used in experiments carried out over 4 years in Michigan. Sprays of maleic hydrazide at 50 to 100 p.p.m. were applied before exposure to cold temperatures (40° to 60° F.) to young plants having 8 to 10 true leaves; at these concentrations maleic hydrazide specifically induced flowering. Concentrations of 500 to 1,000 p.p.m. of maleic hydrazide applied at a later growth stage, when the plants had 37 leaves, retarded seed stalk development.

3821. Marx, T., and Sahm, U.
Gefäss-, Betonkasten- und Feldversuche zu Knollensellerie mit steigenden Gaben Müllerde oder Borsäure. (**Pot, frame and field trials with celeriac receiving graded applications of town waste and boron.**)
*Z. PflErnähr. Düng.*, 1953, **61**: 171-8, bibl. 4.

Composted town waste contains boron. When applied to celeriac, both by itself and in combination with a complete fertilizer, it increased yields to a greater extent than did boric acid. The results, which are presented in some detail, suggest that in the presence of town waste celeriac requires only about one-half of the standard fertilizer application. It was also found that high boric acid applications were much more toxic to the crop than equivalent amounts applied in composted town waste.—Biol. Zentralanst. Land- u. Forstwirtsch., Berlin-Dahlem.

3822. Swank, G., Jr.
**Fungicides for the control of early blight on celery.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 168-72.

Early blight on celery, caused by *Cercospora apii*, can be successfully controlled by tri-basic copper sulphate, bordeaux mixture, nabam, manzate, ferbam, or alternate applications of tri-basic copper sulphate and ziram and ferbam, or alternate applications of tri-basic copper sulphate and nabam.

3823. Geraldson, C. M.
**Field control of blackheart of celery.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 155-9, bibl. 16, illus.

Blackheart, a physiological disease of celery, can be completely controlled in the field by applications of a calcium solution directly to the heart of the plant. Temperature and light as well as unbalanced moisture, high soluble salts and over-fertilization, seem to be factors associated with the prevalence and severity of blackheart. [From author's summary. See also *H.A.* 24: 1546.]

3824. Fisher, D. V., and Edge, E. D.
**Cold storage of celery.**
*A.R. Canada Dep. Agric. Fruit Veg. Prod. Res. Cttee 1953*, pp. 80-1.

An experiment was made to compare wrapping methods for celery, stored at 32° F. in a relative humidity of 85% to 90%, and weighed weekly between 23 October and 7 January. Results showed that waxed paper and a pliofilm liner for celery crates prevented wilting, but the slightly better ventilation of wax paper allowed more normal dissipation of gases and the retention of the normal mild flavour.—Exp. Stat., Summerland.

### *Cucurbits.*

(*See also* 3689c, 3955 l, q, 3956a, b, n.)

3825. Christiansen, E., and Henriksen, A.
Dyrkningsforsøg med stammer af asieagurker. 1946-1950. (**Variety trials with pickling cucumbers 1946-50.**)
*Tidsskr. Planteavl*, 1954, **57**: 498-517.

The trials were carried out at the 4 State horticultural research stations in Denmark with gherkin strains of 3 Danish varieties.

3826. Wilson, J. D., John, C. A., and Myrice, F.
**Ohio MR25, a pickling cucumber highly tolerant to mosaic.**
*Res. Circ. Ohio agric. Exp. Stat.* **25**, 1954, pp. 8, bibl. 5.

Particulars are given of a variety which shows excellent mosaic tolerance, grows vigorously and sets fruit until killed off by frost.

3827. Naaldwijk.
Belichting en suikerbespuiting bij kaskommers. (**Supplementary lighting and sugar sprays for glasshouse cucumbers.**)
*Jaarversl. Proefstat. Groent. Fruit. Glas, Naaldwijk*, 1953, p. 33.

Plants receiving extra light between 12 midday and 12 midnight were larger than those which received extra light before midday. Extra lighting on dark days increased the yield by an average of 2·6 fruits per plant. Plants sprayed with sugar solution 5 times after planting out produced an average of 0·8 fruits per plant more than those without sugar.

3828. Geissler, T., Nickisch, K., and Haenel, H.
Ein Beitrag zur Frage der Hydrokultur von Treibgurken. (**The soilless culture of glasshouse cucumbers.**)
*Arch. Gartenb.*, 1954, **2**: 84-100, bibl. 6, illus.

In a comparison of (1) subirrigated gravel and (2) water culture of glasshouse cucumbers with (3) ordinary soil culture, (1) gave considerably higher and (2) considerably lower returns per plant than (3). The vitamin content of fruits produced in gravel culture was equal to that of fruits from plants grown in soil. Subirrigated gravel culture is recommended to market gardens in short supply of suitable cucumber soil, while water culture should appeal only to amateurs.—Inst. f. Gartenbau, Grossbeeren.

3829. RICHARDS, M.
**Control of fusarium wilt in cucumbers under glass.**
*N.Z. J. Agric.*, 1954, **88**: 548, illus.

Trials were made to test the immunity of the cucumber rootstock *Cucurbita ficifolia* to fusarium wilt, *Fusarium oxysporum*, under New Zealand conditions. Grafted plants were not affected by the disease, but cropping was not so good as in normal plants.

3830. GURLEV, A. S., AND PLATONOVA, E. M.
**New means of controlling spider mite and powdery mildew on cucumber.** [Russian.]
*Sad i Ogorod*, 1954, No. 7, pp. 23-4.

Combined applications of 0·03% NIUIF-100 with 0·2% colloidal sulphur or 0·05% copper sulphate gave very good control of red spider [*Tetranychus telarius?*] and some other pests of cucumber and prevented the development of powdery mildew [*Erysiphe cichoracearum?*]. Yields of both greenhouse and frame-grown cucumbers were increased. [See also *H.A.*, 24: 455.]

3831. MACCOLLUM, G. B.
**Tolerance of cucumbers to component compounds of technical DDT.**
*J. econ. Ent.*, 1954, **47**: 272-4, bibl. 7.

DDT is toxic to some varieties of cucumber. When in New York activated charcoal was included in a 2% DDT dust at the rate of 3: 1, the phytotoxic effect on the variety Niagara was greatly reduced. From a test with the 5 major components of DDT, it appeared that the amounts of op′DDT and pp′DDT present in 3 lb. of technical material retarded growth of the cucumber variety about equally. pp′DDD, dichloro diphenyl sulphone and 2T 1-o CpCS, applied at the rate present in 3 lb. of technical material, did not appear to retard growth.

3832. NOVIKOF, V. A.
Essais d'amélioration des variétés dans les cultures de melon et de pastèque en Tunisie. **(Better melon and watermelon varieties for Tunisia.)**
*Ann. Serv. bot. agron. Tunis*, 1951, **24**: 65-100, bibl. 11, illus. [received 1954].

The Tunisian varieties of watermelon are inferior and should be replaced with introduced varieties such as Angelino, Chilian, Klondike Striped and Klondike R.7. Tunisian melon varieties include several types suitable for breeding; MR 45, Persica 5 and Turkestan are among promising introduced varieties now on trial.

3833. IVANOFF, S. S.
**Breeding for better cantaloupe.**
*Mkt Grs' J.*, 1954, **83** (6): 28.

Breeding work at State College, Mississippi, has now produced varieties with desirable qualities including resistance to downy mildew and/or powdery mildew and to the melon aphid. Further improvement is being sought in earliness, good appearance and shipping qualities.

3834. WILLIAMS, B. L., AND WENDER, S. H.
**The isolation of a flavonoid substance from watermelon.**
*Proc. Okla Acad. Sci. 1952*, 1954, **33**: 247-9, bibl. 1.

A report is given on the isolation of a flavonoid from Florida Black Diamond watermelon and its properties, and on a preliminary investigation into its identity.

3835. ANON.
**Packing watermelons crosswise in car cuts shipping loss.**
*Agric. Res.*, 1954, **3** (1): 11, illus.

Crosswise loading of watermelons in rail-wagons reduced the number of bruised melons by 75%, cracked by 69%, decayed by 32% and total number lost by 65%, on arrival at their destination. Packing in this way brings the melons into contact with each other where the rind is thickest and strongest.

3836. HILLS, O. A., AND TAYLOR, E. A.
**Effect of curly top-infective beet leafhoppers on cantaloup plants in varying stages of development.**
*J. econ. Ent.*, 1954, **47**: 44-8, bibl. 3.

In further enlarged experiments in Arizona [for an account of earlier work see *H.A.*, 20: 2783], beet leafhoppers, *Circulifer tenellus*, were encaged on cantaloupe plants in various stages of development. It was found that the earlier the stage at which the plants were infected, the more severely were they damaged. The fact that retardation of growth and reduction in yield may follow beet leafhopper infestation without producing recognizable symptoms indicates the possibility of yield reduction in cases not ordinarily attributed to curly top.

3837. RUNOV, V. I., AND KAČAN, S. S.
**The ammonia content of melon leaves affected by fusarium wilt.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1953, **93**: 717-19, bibl. 8.

Although certain workers have found that the presence of some parasitic organisms affects the ammonia content of plants, in the experiments described no such effect was observed. The seasonal fluctuation in the ammonia content of healthy melon leaves was considerably greater than the difference between the ammonia content of healthy and fusarium-infected leaves during any given period.

3838. NISHIDA, T.
**Further studies on the treatment of border vegetation for melon fly control.**
*J. econ. Ent.*, 1954, **47**: 226-9, bibl. 4.

In experiments in Hawaii it was found that melon fly, *Dacus cucurbitae*, can be effectively controlled by treating wild border vegetation around cucumber and tomato fields with parathion at 1 lb. of 25% w.p. per 100 gal., applied with conventional-type power sprayers. The border-treated fields produced a markedly lower percentage of infested fruits than the control fields in which the crop itself was sprayed. The failure to obtain control when crop treatments were made was ascribed to the fact that the insects enter crop areas to lay eggs and not to feed, and therefore do not acquire lethal amounts of the applied material. [See also *H.A.*, 24: 454.]

3839. DELANOUE, P.
Essais de traitements chimiques contre *Epilachna chrysomelina* F. **(Experiments on the control of *Epilachna chrysomelina*.)**
*Ann. Serv. bot. agron. Tunis*, 1951, **24**: 21-32, illus. [received 1954].

SNP, DDT, phenothiazine (DBT), dieldrin, BHC, rotenone and chlordane were tested against the adults, larvae and eggs of this pest of cucurbits. 10% DDT is recommended as the most generally useful product against adults and larvae; it gave 100% mortality in 2 days in both cases. Only 27% DBT was effective against eggs; it gave a 100% kill.

3840. BATRA, H. N.
**Biology and control of *Dacus diversus* Coquillet and *Carpomyia vesuviana* Costa and important notes on other fruit flies in India.**
*Indian J. agric. Sci.*, 1953, **23**: 87-112, bibl. 14, illus.

With coloured plates of *Dacus diversus* and *Carpomyia vesuviana* and their damage to gourds and ber (*Zizyphus jujuba*) respectively.

### *Legumes.*

(*See also* 3334, 3353, 3354, 3385, 3392, 3407, 3917, 3955a, b, k, r, t, 3956c, i, k.)

3841. CLARK, B. E., LITTLE, H. B., AND HOFER, A. W.
**The quality of seeds on sale in New York as revealed by tests completed in 1953. With an appendix on legume inoculant tests for 1953.**
*Bull. N.Y. St. agric. Exp. Stat.* **760**, 1954, pp. 41.

Tables are given of wholesale and retail sources of flower and vegetable seeds in New York State and the field performance of the seed supplied. The methods and results of inoculating legume seeds to increase nodule formation are given.

3842. GELIN, O. E. V.
**X-ray mutants in peas and vetches.**
*Acta Agric. Scand.*, 1954, **4**: 558-68, bibl. 3, illus.

The work on X-ray mutants of peas and vetches since 1941 in Sweden is surveyed and discussed. Of 6 Kloster pea plants maturing after irradiation with 15,000 r, one gave rise to both normal and *fasciata* plants, which included 2 given the numbers 700 and 699. No. 700, a normal plant, was more vigorously vegetative than Kloster, ripened 4 days earlier, and in trials in different parts of Sweden gave a 2·5% higher yield than its parent. No. 699, a *fasciata* plant, ripened 2·4 days after Kloster and gave a 16% lower yield.

3843. WARNOCK, S. J., AND HAGEDORN, D. J.
**Stigma receptivity in peas (*Pisum sativum* L.).**
*Agron. J.*, 1954, **46**: 274-7, bibl. 7, illus.

Careful pollen placement on the stigma rather than on the stylar hairs gave a higher percentage of fertilized flowers and more seeds per pollination developed. Temperature studies indicated that stigmas of Wisconsin Perfection retained maximum receptivity at 16° C., being still highly receptive on the 2nd day after emasculation and with some receptivity when 3 days old; at 20° and 24° C. good stigma receptivity was retained for only one day after emasculation. In the field receptivity of Alaska, Wisconsin Perfection, and Perfected Wales remained at about the same level as at emasculation for at least 1 day. Alaska stigmas retained their receptivity longer than the other 2 varieties, although this was probably due to lower temperatures when the stigmas were awaiting pollination.—Univ. Wisconsin, Madison.

3844. THOMSON, B. F.
**The effect of light on cell division and cell elongation in seedlings of oats and peas.**
*Amer. J. Bot.*, 1954, **41**: 326-32, bibl. 17.

Pea seedlings were grown at constant temperature, with series in total darkness, with a short daily period of illumination, and in darkness except for a single light exposure at 1 to 6 days after the start of germination. Plants were harvested at daily intervals or less, and the numbers and lengths of cells in the 2nd, 3rd and 4th internodes were determined. Results showed that light accelerated the growth processes taking place while the light stimulus acted, but the specific effect depended on the stage of development of the tissue.

3845. LEOPOLD, A. C., AND GUERNSEY, F. S.
**Flower initiation in the Alaska pea. II. Chemical vernalization.**
*Amer. J. Bot.*, 1954, **41**: 181-5, bibl. 14.

Chemical vernalization is the term applied to flower promotion by auxin treatment of seeds followed by low temperature. Results of this technique on Alaska pea showed that (1) naphthaleneacetic acid, β-naphthoxyacetic acid, 2,3,5-triiodobenzoic acid and thiamine were among effective materials for chemical vernalization; (2) after chemical vernalization varied day-length did not alter the response, although the promotive effect was greatly reduced by high light intensities (800 ft.-c.); (3) chemical vernalization effects were nullified by heat (39° C. for 18 to 24 hours), by N atmosphere (for 48 to 96 hours), or by $CO_2$-free air (for 12 hours) applied after the cold treatment.—Purdue Univ., Lafayette, Indiana. [See also *H.A.*, 23: 3070.]

3846. BLOMFIELD, P. D.
**Note a molybdenum response on peas in Nelson.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 46, bibl. 6.

Responses were obtained in 2 trials to 2 oz. Mo per acre applied either as pre- or post-emergence sprays of sodium molybdate. Compared with untreated peas the treated plants were a better colour, slightly taller and had pinkish nodules which were larger than the greyish nodules on the control plants. The treated peas were more resistant to collar rot and yielded twice the crop of the untreated.

3847. CROFTS, F. C.
**Superphosphate and molybdenum—responses in peas at Wollongbar.**
*Agric. Gaz. N.S.W.*, 1954, **65**: 185-6, illus.

Experiments were carried out with Massey Gem peas on red basaltic soils in New South Wales, using inoculum, lime, and superphosphate treatments. Results showed that superphosphate at 4 cwt. per acre gave an average yield increase of 9·7 bushels per acre. Superphosphate at 4 cwt. per acre, plus crude sodium molybdate at 8 oz. per acre, gave a yield increase of 11·9 bushels per acre. Lime applied at 1 ton per acre did not increase the yield; the inoculum used was not suitable under the particular conditions of this experiment.

3848. Hagedorn, D. J., and Walker, J. C.
**Virus diseases of canning peas in Wisconsin.**
*Res. Bull. Wis. agric. Exp. Stat.* **185,** 1954, pp. 33, bibl. 38, illus.

The six diseases considered in detail and differentiated are the common pea mosaic, pea mosaic caused by bean virus 2, enation pea mosaic, pea streak virus, pea stunt disease and cucumber mosaic.

3849. Simons, J. N.
**Vector-virus relationships of pea-enation mosaic and the pea aphid *Macrosiphum pisi* (Kalt.).**
*Phytopathology*, 1954, **44**: 283-9, bibl. 18.

Factors studied were acquisition threshold period, inoculation threshold period, latent period and efficiency of transmission by nymphs and adults, and post-acquisition-feeding starvation.—Dep. Entom. Parasit., Univ. Calif., Berkeley.

3850. Barker, J. S., and Tauber, O. E.
**Fecundity of the pea aphid on garden pea under various combinations of light, moisture, and nutrients.**
*J. econ. Ent.*, 1954, **47**: 113-16, bibl. 2.

Highly succulent plants, such as are produced under conditions of reduced light and high moisture, were not so conducive to production of young aphids as were well differentiated plants. Fecundity of *Macrosiphum pisi* decreased as the level of nitrogen fertilization increased with pea plants cultured under conditions of full light and lower moisture. Also, plant injury decreased as nitrogen levels increased; thus a plant on high nitrogen nutrition was more tolerant of pea aphid feeding. [From authors' conclusions, see also *H.A.*, 22: 2595.]

3851. Edwards, C. A.
**Experiments on the control of pea moth.**
*Plant Path.*, 1954, **3**: 66-7, bibl. 1.

In Wiltshire trials good control of the pea moth, *Laspeyresia nigricana*, was obtained by dusting with 5% DDT at 1 cwt. per acre when flowering was at its maximum and the first pods were formed. The dusting appeared to be more effective in controlling early larvae than late ones.

3852. Scheibe, A.
Die phänophasisch bedingte Typenresistenz der Erbsensorten gegen den Erbsenwickler. (*Grapholitha nigricana* Steph. = *Laspeyresia* [*Cydia*] *nigricana* Steph.) **(The influence of phenological factors on the resistance of pea varieties to *Laspeyresia nigricana*.)**
*Phytopath. Z.*, 1954, **21**: 433-48, bibl. 7, illus.

A close relationship was shown to exist in pea varieties between the duration of their flowering period and the degree of their infestation by pea moth, the time of flowering being another factor affecting incidence of the pest. Early-flowering varieties of the *fasciata* type characterized by a short, compact bloom escaped injury from pea moth more satisfactorily than other varieties repeatedly treated with synthetic insecticides.—Max. Planck Inst. f. Züchtungsforsch., Neuhof b. Giessen.

3853. Franssen, C. J. H.
De levenswijze en de bestrijdingsmogelijkheden van de erwtenpeulboorder. **(Biology and control of pea moth, *Enarmonia nigricana* F.)** [English summary 1 p.]
*Meded. PlZiekt. Dienst* **70,** 1954, pp. 50, bibl. 38, illus.

Pea moths are attracted by flowering pea fields and lay their eggs almost exclusively on flowering plants. The first larvae do not appear until the lowest pods begin to swell, and they can enter any pod regardless of its stage of development. Control methods are directed against newly-hatched larvae, which have not yet bored into the pods; the right time to begin spraying may be estimated by looking for the first larvae on the lower pods, or it may depend on the stage of crop development. Parathion gives good control when applied at 400 g./ha., and leaves no harmful residues in the peas. For peas sown at the normal time the edges of the field are first sprayed when the lowest pods begin to swell, and this is followed by treatment of the whole field. Peas for canning are sprayed before the lowest pods are three-quarters grown.

3854. Franssen, C. J. H.
De levenswijze en de bestrijdingsmogelijkheden van de erwtenknopmade. **(Biology and control of pea midge, *Contarinia pisi* Winn.)** [English summary $\frac{3}{4}$ p.]
*Meded. PlZiekt. Dienst* **71,** 1954, pp. 36, bibl. 25, illus.

The pea midge can do serious damage to pea crops in Holland; the larvae live mainly on the flower buds, which swell rapidly but form no pods. In Holland the midges usually appear during the second half of May. Spraying must be started when the first midges are seen on the growing shoots. For spraying, a DDT oil-emulsion is used at the rate of $\frac{1}{2}$ kg. DDT per hectare. Oil emulsions are effective for about 10 days, and spraying should be repeated later if live midges are still found.

3855. Sasaki, S., Sawada, E., and Watanabe, H.
**Ecological studies on common bean varieties.**
[Japanese, with English summary 12 lines.]
*Res. Rep. Japan Minist. Educ.* **17,** 1954, pp. 39-44, bibl. 11.

In kidney bean trials yields of all varieties were higher under cooler conditions. This depended on the number of flowers produced but not on the percentage of pod set. Cool conditions favoured flower production. Under warmer conditions seed size was less and the percentage of imperfect seed was greater.

3856. Moore, J. F., and Carstens, M. W.
**Bush bean variety studies in Western Washington.**
*Bull. Wash. St. agric. Exp. Stats* **511,** 1954, pp. 13, bibl. 2.

Hitherto Blue Lake pole beans have been the type of bean grown in western Washington. They need a heavy initial outlay in posts, stakes, wire, etc. An account is given in this bulletin of the testing at Puyallup and Mount Vernon of bush snap beans which would not require so much initial capital as pole beans.

3857. MASTENBROEK, C.
Veredeling van landbouwstambonen op resistentie tegen de vetvlekkenziekte. **(Breeding haricot beans for resistance to halo blight.)**
*Not. Studiekr. PlVered.*, 1953, pp. 496-503, from English summary in *Euphytica*, 1954, **3**: 167.

Varietal susceptibility to halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) is tested by injecting bacterial suspensions into the hypocotyl of emerging seedlings. Varieties shown to be resistant in the field are further checked by this method. Crosses between the resistant varieties Red Mexican 34 and Ceka, and Beka and Strooboon gave the best results. A back-cross (Ceka × Mexican 34) × Ceka has given very productive strains.

3858. MOORE, J. F., AND ALLMENDINGER, D. F.
**Blue Lake pole beans in western Washington. Varietal, plant- and row-spacing, and growth regulating materials studies.**
*Bull. Wash. St. agric. Exp. Stats* **548,** 1954, pp. 17, bibl. 8.

Results of 5-year varietal tests indicated that the present varieties grown are well suited to western Washington. Two-year trials with 2 new early stringless varieties, F.M. 1 and Stringless 21, showed promising results. Seeding rates of 20 lb. per acre appeared adequate for good plant stands and high yields. The use of growth regulating substances to reduce blossom drop was not promising.

3859. ALLARD, R. W., AND SMITH, F. L.
**Dry edible bean production.**
*Circ. Calif. agric. Exp. Stat.* **436,** 1954, pp. 28, illus.

California and Michigan tie for leadership in bean production in the U.S.A., each producing about one-fourth of the total. Precise information is given on varieties, cultivation including pest and disease control, harvesting, marketing and storing.

3860. WOODHAMS, D. H., AND KOZLOWSKI, T. T.
**Effects of soil moisture stress on carbohydrate development and growth in plants.**
*Amer. J. Bot.*, 1954, **41**: 316-20, bibl. 20.

The effects of different degrees of moisture stress on carbohydrate reserves and plant growth were studied in bean and tomato. Starch and sugar analyses showed that before the plants reached the permanent wilting percentage for the first time there was a decrease in sugars and starch in roots, stems and leaves; after irrigation there was a rapid starch increase but no corresponding sugar increase. After a subsequent period of 8 weeks' growth, in which there were several severe drought periods followed by irrigation, total reserve carbohydrates were much less than at any other period. Thus recurrent severe droughts will result in serious starch and sugar depletion.

3861. JOUBERT, T. G. LA G.
**Hard-skin in beans.**
*Fmg S. Afr.*, 1954, **29**: 225, 232, bibl. 2.

Hard-skin was found in the runner bean variety Green Savage at Pretoria Horticultural Research Station. A relative humidity of less than 30% during the storage period (June to September) was probably the cause; the condition gradually disappeared with an increase in humidity.

3862. SAHM, U.
Modellversuche zu Bor- und Sulfidschäden als Beitrag zur Müllverwertungsfrage. **(Pot experiments on boron and sulphide injuries as a contribution to the problem of utilizing town wastes.)**
*Z. PflErnähr. Düng.*, 1953, **60**: 244-9, bibl. 7.

The experimental plants included dwarf beans, the yields of which were greatly reduced by the higher rates of boron applied. In the presence of a complete fertilizer the plants were more tolerant to high concentrations of $H_3BO_3$ in the soil.—Biol. Zentralanst. Berlin-Dahlem.

3863. KAHN, R. P., AND SCHACHTNER, N. D.
**The relative effect of rate of drying and potassium phosphate in the inoculum on plant virus infections.**
From abstr. in *Phytopathology*, 1954, **44**: 389.

In the absence of phosphate from the inoculum tobacco mosaic, tobacco necrosis and southern bean mosaic caused 2–3 times more infection when inoculated bean leaves were dried quickly than when they were dried slowly.

3864. DEEN, O. T., AND HALLOCK, H. C.
**Beet leafhopper control experiments on snap beans grown for seed.**
*J. econ. Ent.*, 1954, **47**: 122-6, bibl. 7.

In Idaho insecticides showing promise in laboratory experiments were tested in the field against beet leafhopper, *Circulifer tenellus*, the vector of curly top virus. While DDT, in various formulations, was better than the other materials used, protection afforded to beans against curly top was inadequate and the control project is being continued.

3865. TREGGI, G.
Virosi e fusariosi del fagiolo nella zona dell' agro pisano. **(A virus-and-fusarium infection of french beans in the Pisa district.)** [English summary 12 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 1213-26, bibl. 16, illus.

The symptoms are described of a decline in french beans due to simultaneous infection by *Phaseolus* virus I and *Fusarium solani*.—Ist. Pat. veg. Univ. and Osserv. reg. fitopat., Pisa.

3866. YARWOOD, C. E.
**Zinc increases susceptibility of bean leaves to tobacco mosaic virus.**
*Phytopathology*, 1954, **44**: 230-3, bibl. 10, illus.

Zinc sulphate or calcium chloride increased the number of lesions in TMV-inoculated bean leaves. The number of lesions and amount of virus in leaves inoculated on their upper surface were much increased by incubating the leaves with their lower surfaces on zinc sulphate or silver nitrate. Dipping in silver nitrate usually completely prevented lesion formation in inoculated leaves. The treatments which increased the number of lesions on bean decreased them in *Nicotiana glutinosa*.—Univ. Calif., Berkeley.

3867. Bazán de Segura, C.
"El hielo amarillo", enfermedad bacteriana del frijol en el Peru. (**Halo blight, a bacterial disease of french beans in Peru.**) [English summary 13 lines.]
*Bol. Estac. exp. agric. La Molina* **50**, 1953, pp. 15, bibl. 11.

Notes on halo blight, *Pseudomonas medicaginis* var. *phaseolicola*, of french beans, here reported for the first time in Peru, and its control.

3868. Casarini, B.
Prove di lotta contro la ruggine del fagiolo [*Uromyces appendiculatus* (Pers.) Lk.]. (**Control tests on bean rust, *Uromyces appendiculatus*.**) [English summary 7 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 1173-80, bibl. 4, illus.

Four fungicides were compared for the control of bean rust in greenhouse tests in 1951. Zinc ethylene bisdithiocarbamate was the best and was followed closely by zinc ethylene bisdithiocarbamate plus copper. Wettable sulphur gave moderate and copper oxychloride poor control. The dithiocarbamate was not effective as a systemic protectant.—Lab. sper. Pat. veg., Bologna.

3869. Sterling, C.
**Development of the seed coat of lima bean (*Phaseolus lunatus* L.).**
*Bull. Torrey bot. Cl.*, 1954, **81**: 271-87, bibl. 35, illus.

The histogenesis of the seed coat of lima bean was studied with a view to determining the relative maturity of beans used for freezing. The following phenomena are correlated with the optimum edible maturity of the seed; disappearance of starch from the parenchyma cells of the outer integument; development of hemicellulosic wall thickenings in palisade cells over the entire extent of the seed coat; and the formation of lignin in the middle lamella between the 2 adjoining palisade layers at the hilum.

3870. Cox, R. S.
**Effect of temperature on the development of downy mildew of lima bean.**
*Phytopathology*, 1954, **44**: 325-7, bibl. 4.

Initial penetration of host tissues apparently occurred directly through the cuticle. Symptoms failed to develop on carbohydrate-deficient plant parts; carbohydrate content appeared to be affected by the time of day at which the pods and leaves were removed from the plant, and by the temperature at which they were subsequently incubated. [From author's summary.]—Delaware agric. Exp. Stat., Newark.

3871. Stone, M. W., and Foley, F. B.
**Field experiments with insecticides for the control of wireworms in irrigated lands.**
*J. econ. Ent.*, 1953, **46**: 1075-83, bibl. 3, illus.

Experiments were conducted in lima bean fields in California from 1946 to 1953 to determine the effectiveness of some chlorinated hydrocarbon insecticides against the sugar beet wireworm, *Limonius californicus*. Of the materials used the best results were obtained with DDT, which at 10 lb. per acre gave control for 4 years, and at 20 lb. for 5 years. BHC and lindane at 0·5 lb. of the $\gamma$-isomer per acre, chlordane and heptachor at 10 lb. and dieldrin at 1 and 2 lb. each controlled wireworms for 3 years.

### *Mushrooms.*

(*See also* 3955c, h.)

3872. Mushroom Research Association Ltd., Yaxley.
*Report of the Mushroom Research Station, Yaxley, Peterborough, for year 1953*, 1954, pp. 46, 5s.

Yaxley Research Station is to be closed on 30 September, 1954, and mushroom research will thenceforward continue at the Toddington Glasshouse Crops Research Institute. *Chemistry Department.* Subjects studied were water-holding properties of peat, bed temperature changes during the cropping cycle, and the effect of adding compost to casing soil. *Cropping experiments.* Peat significantly increased the yield of 3 commonly-used casing soils, brought one into cropping sooner and delayed cropping in the other two. None of 3 soil conditioners tested improved cropping. Other experiments concerned peat-sand, peat-vermiculite and Yaxley soil as casing soils, 4 peat-sand mixtures and 3 watering treatments, lime, and depth of casing material. *Microbiology Department.* Research included a comparison of 2% mixed xylenols, 1% formalin and 55° C. steam as disinfectants, a study of the effect of ultraviolet irradiation on spore germination in mushroom disease fungi, and bacterial pit investigations.

3873. Delmas, J.
La culture du champignon de couche: techniques nouvelles. (**Mushroom culture: new methods.**)
*C.R. Acad. Agric. Fr.*, 1954, **40**: 409-10.

Experiments made, controlled or directed by the Experiment Station of the Mushroom Growers' Federation at St-Cyr-l'École during the last 3 years with a view to putting the latest principles into practice have concerned (1) crumbling of manure before composting to ensure intimate mixture of manure and straw, a technique which has increased yield by 30–50%; (2) short composting; (3) fertilization of compost; (4) culture in trays with a capacity of 18–20 kg. of compost and yielding 2·5–4·0 kg. of mushrooms; (5) peak heating at 55–56° C. for 12–24 hours in a saturated atmosphere; (6) spawning at 18–22° C. in a saturated atmosphere; (7) casing with different materials; and (8) harvesting. The new techniques, together with the use of artificial manure, have given yield increases of 25–50%. [See also *H.A.*, 24: 2719.]

3874. Storey, I. F.
**Mummy disease of mushrooms.**
*Plant Path.*, 1954, **3**: 49, bibl. 2, illus.

Soil and compost from a mushroom bed infected with mummy disease were mixed into a new bed, and in 3 weeks all mushrooms produced showed typical disease symptoms. No evidence of the disease being caused by a virus could be found [see *H.A.*, 22: 4539]. It would appear to be caused by some organism present in the soil.

3875. Boxall, H. G.
**Oil to catch the flies as they come in.**
*Grower*, 1954, **42**: 131, illus.

A brief note, with a diagram, on a sciarid trap fitted inside the ventilators of mushroom houses. The trap consists of 2 overlapping panes of glass with a passage for air between them. The inner pane is coated with oil and can be removed every 3 days, washed in paraffin and re-coated with oil.

## *Onions and related crops.*

(*See also* 3955j, v, w, 3956d, h, 4003c.)

3876. Imazu, T., and others.
**Ecological studies on onion varieties.**
Fujii, T., and others.
**Ecological studies on Welsh onion varieties.**
[Japanese, with English summaries ½ p. and ¼ p.]
*Res. Rep. Japan Minist. Educ.* **17,** 1954, pp. 16-32, bibl. 21, illus., and pp. 55-75, bibl. 2.

The results are given of varietal experiments begun at 5 different centres in 1950. *Autumn sowing.* The rate of bolting was high in the south and very low in the north, bulb formation occurred earlier in warmer areas and late varieties gave good results in cooler areas. *Spring sowing.* The bulbs of earlier varieties developed more rapidly than those of later varieties. *Temperature.* Bulb development started at 15° C. and was forced at 25° C. At the same temperature bulb development was more rapid in early than in late varieties. *Initiation of floral primordia* began at 5–10° C.

3877. Anon.
**New era for onions.**
*Agric. Res.*, 1954, **3** (1): 10-11, illus.

Twelve new hybrid onions for use in the northern states of the U.S. are briefly described, by type. In tests in Texas, Granex, a southern hybrid, showed improvement over the older varieties Crystal Wax, Yellow Bermuda and Texas Grano. On pink-root-free soil Granex yielded 869 bags of U.S. No. 1's per acre where the older varieties yielded 132, 233 and 683 bags per acre respectively. On pink-root-contaminated soils no new hybrid gave more than 14 bags of culls per acre, where older varieties gave 213, 108 and 103 bags respectively.

3878. Geloso, A.
**French methods of onion cultivation.**
*Grower*, 1954, **42**: 207-8.

The 2 main onion crops grown in France are the autumn-sown and the spring-sown; varieties and cultivation methods are given.

3879. Ceruti, A.
Sull'assorbimento e sulla fissazione del fosforo nei vegetali. Nota I. Ricerche eseguite sulle foglie di *Allium cepa* con l'isotopo radio-attivo. **(Phosphorus absorption and fixation in plants. Note I. Research on the leaves of *Allium cepa* with the radioactive isotope.)** [English summary ½ p.]
*Ann. Sper. agrar.*, 1954, **8**: 1025-41, bibl. 21.

Phosphorus translocation and fixation in the onion were studied by supplying $KH_2P^{32}O_4$ to sprouting bulbs, outer scales and excised leaf tips. In the entire leaf the translocation rate was about 2·4 cm. per hour at 15° C.; equilibrium between translocation and fixation was reached after 20 days, fixation then being much higher in the upper than the lower part of the leaf. In sprouting bulbs phosphorus travels from the roots and the scales to the leaves and from one leaf to another through the disc but not from the leaf to the scales or the roots.—Staz. chim.-agrar. sper., and Ist. bot., Univ. Turin.

3880. van Beekom, C. W. C., and Koert, J. L.
Het uitlopen van bewaaruien. **(Sprouting of stored onions.)** [English summary 6 lines.]
*Meded. Dir. Tuinb.*, 1954, **17**: 525-31, bibl. 1, illus.

0·25% maleic hydrazide, sprayed at the rate of 700 to 750 litres per ha., 2 weeks before harvest, reduces sprouting in onions during storage, without increasing rot or affecting quality. The effect is lost if rain falls within 24 hours of spraying.

3881. Jacks, H., and others.
**Vegetable therapeutant trials 1952-53. Diseases of onions.**
*N.Z. Comm. Gdnrs' J.*, 1954, **9** (10): 3-4.

Experiments in New Zealand with several spray materials were made on the control of downy mildew, *Peronospora destructor*, on Pukekohe Long Keeper sprayed at the seedling stage and after transplanting and the results were tabulated. On seedlings treatments were made at 10-day intervals starting when the plants were 3 inches high; recordings were taken when the plants were 8 to 10 inches high. Significant increases in plant weight were shown by plants sprayed with 6 applications of the following (all concentrations in 100 gal.): bordeaux mixture with summer oil at 6 lb.-8 lb.-0·5 gal., dithane D-14 with zinc sulphate and hydrated lime at 2 lb.-1 lb.-0·5 lb., cosan at 10 lb., fermspray at 2 lb., dithane Z78 at 2 lb., zirospray at 2 lb., and ialine colloidal copper and summer oil at 15 lb.-0·5 lb. Significant increases in average plant weight and average plant number per 2 ft. row were shown by seedlings sprayed with 9 applications of bordeaux with summer oil at 6 lb.-8 lb.-0·5 gal., cop-ox and peps at 5 lb.-0·5 lb., and phygon XL and peps at 1 lb.-0·5 lb. At harvest seedlings sprayed as in both of these trials showed increases in average plant weight and average plant number per 10 ft. row when the following sprays were used: bordeaux with summer oil at 6 lb.-8 lb.-0·5 gal. and with peps at 6 lb.-8 lb.-0·5 lb., cop-ox with summer oil at 5 lb.-0·5 gal. and with peps at 5 lb.-0·5 lb., perenox with summer oil at 5 lb.-0·5 gal. and with peps at 5 lb.-0·5 lb., phygon XL with summer oil at 1 lb.-0·5 gal. and with peps at 1 lb.-0·5 lb., and ialine colloidal copper with summer oil at 15 lb.-0·5 gal. and with peps at 15 lb.-0·5 lb. With transplanted onions sprayed at 10- and 20-day intervals from October to mid-February there was no significant difference between the effect of the spray intervals; the average number of plants per 10 ft. of row and the average plant weight were increased in treatments using bordeaux with summer oil and with peps, cop-ox with peps, perenox with peps and ialine colloidal copper with peps.

3882. van Doorn, A. M., Koert, J. L., and van der Vliet, M.
De bestrijding van valse meeldauw in uien en sjalotten. (**Control of downy mildew in onions and shallots.**) [English summary 20 lines.]
*Meded. Dir. Tuinb.*, 1954, **17**: 432-6.

Trials in Holland during 5 years, on the control of downy mildew in onions, caused by *Peronospora destructor*, have led to the following conclusions: Zn compounds sprayed at the rate of 3 kg. in 100 litres of liquid per hectare gave the most satisfactory results. The crop should be treated for the first time before the mildew appears on main crop onions, and spraying should be repeated every 7 to 10 days according to weather conditions. [See also *H.A.*, 24: 2756.]

3883. Agati, J. A., Garcia, G. M., and Rodrigo, P. A.
**Studies on the control of downy mildew blight of onion in the Philippines particularly in Ilocos Norte.**
*Philipp. J. Agric.*, 1954, **17**: 153-81, bibl. 12, illus.

Downy mildew (*Peronospora destructor*) is a limiting factor in commercial onion growing in some districts of the Philippines and is particularly severe in the varieties Yellow Bermuda and Red Globe. In experiments in 1948/50 lime-sulphur and bordeaux mixture gave equally good control in bulb crops, the yields being 4·9 kg. per plot compared with 3·4 kg. in the control. In seed crops lime-sulphur gave the better yield of cleaned seed, namely 15 g. per plot compared with 9 g. with bordeaux and 4 g. in the control.

3884. Jacks, H., Harrison, R. A., and Dawe, T. C. R.
**Control of onion thrips at Pukekohe.**
*N.Z. J. Agric.*, 1954, **88**: 557-8, illus.

Trials were made on the control of onion thrips, *Thrips tabaci*, using contact, contact and residual, and systemic insecticides sprayed at 7-, 10- and 14-day intervals. From results obtained it is recommended that applications of "Trimort" DDT emulsion at 5 lb. in 100 gal. should be made at 10-day intervals, starting between early November and December and continuing until 14 days before harvest.

3885. Bruinsma, F., and Seinhorst, J. W.
Warmwaterbehandeling van sjalotten tegen aantasting door stengelaaltjes (*Ditylenchus dipsaci* (Kuhn) Filipjev). (**Hot water treatment of shallots against attack by stem and bulb eelworm (*Ditylenchus dipsaci*).** [English summary 9 lines.]
*Meded. Dir. Tuinb.*, 1954, **17**: 437-46, bibl. 1, illus.

The following 3 methods of hot water treatment give efficient control of stem eelworms in shallots: 2 hours at 43·5° to 44° C.; 90 min. at 45° C.; 60 min. at 46° C. The treatment also controls secondary downy mildew (*Peronospora destructor*). Autumn treatment will prevent losses during winter storage, but spring treatment is also possible.

## *Root crops.*

(*See also* 3370, 3903, 3955u, 3956e, j.)

3886. Wellensiek, S. J., and Verkerk, K.
**Annual seed growing of beets.**
*Neth. J. agric. Sci.*, 1954, **2**: 98-104, bibl. 9.

Experiments were carried out at Wageningen to develop a practical method of seed production from beet in one year. It was shown that natural cold, affecting plants sown in frames at the beginning of January, had a stronger flower promoting effect than artificial vernalization. Supplementary lighting to extend the photoperiod to 24 hours markedly increased the number of good seed plants. Early sowing plus supplementary light until transplanting with the varieties Egyptische Platronde and Noord-Hollandse Bleekblad increased the percentage of good seed plants to 96–100%.

3887. Nicolaisen-Scupin, L., and Nicolaisen, N.
Feststellungen über den Zuckergehalt an 6 Möhrensorten und dessen Verhalten während der Mietenlagerung. (**Observations on the sugar content of 6 carrot varieties and its retention during clamp storage.**) [English, French and Spanish summaries.] *Mitt. Klosterneuburg, Ser. B*, 1954, **4**: 104-11, bibl. 5.

The total sugar, monosaccharide and disaccharide, contents of core and cortex was determined in 6 carrot varieties in relation to dry matter and fresh weight. 7·26% (cortex) and 5·53% (core) in Sudenburger to 4·66% and 3·69% respectively in another variety. Sugars declined during 6 months' clamp storage, but less in Sudenburger than in the others. It is suggested that in storage trials with carrots loss of nutritional value should be taken into account.

3888. Wiggans, S. C.
**Growth and organ formation in callus tissues derived from *Daucus carota*.**
*Amer. J. Bot.*, 1954, **41**: 321-6, bibl. 11, illus.

Discs of Red Core Chantenay carrot were cultured on a nutrient medium, to which various growth promoting substances were added. Cambial tissue segments gave the greatest response to treatments, both in increase in cell size and in formation of callus tissue. Root formation was induced both by the presence of IAA and by coconut milk; bud formation was not consistently induced by any substance tested. Increasing the amounts of IAA up to the optimal concentration for dry weight increases (10 mg./l.) caused corresponding increases in reducing sugars and total sugar of carrot tissue. Coconut milk, adenine sulphate and carrot leaf extract, while causing dry weight increases, produced marked decreases in reducing sugars and total sugar concentrations. When IAA was optimal and other factors limited growth, tissue composition was apparently regulated by the balance between growth factors.

3889. Budnickaja, E. V.
**Biosynthesis of carotene in root crops.** [Russian.]
*Biohimija*, 1954, **19**: 216-22, bibl. 21.

Experiments were conducted to determine some of the conditions which influence the biosynthesis of carotene in harvested carrots and sweet potatoes. Carrots grown under different conditions and of different ages showed an increased carotene content on storage at 18–24° C. for 24–168 hours, and both storage in the dark and in an atmosphere containing about 5% $CO_2$ were inducive to further increase.

3890. GOODMAN, O.
**A preliminary investigation of some factors affecting quality and yield in carrot crops.**
*J. Dep. Agric. Dublin*, 1952-53, **49**: 99-105.

Experiments were made in Eire on the relationship of root splitting and yield of carrots to N manuring, variety, and time of sowing, using the carrot varieties Nantes, Early Market, Chantenay, and James Scarlet Intermediate. The results showed that root splitting increased with the N content of the soil. Time of sowing and variety did not seem to affect the response. Higher yields of carrots were obtained by moderate dressings of sulphate of ammonia (3 cwt. per acre) than by high dressings.

3891. OSNICKAJA, E. A.
**Control of carrot phomosis.** [Russian.]
*Sad i Ogorod*, 1954, No. 7, pp. 19-21.

Treating carrot seed with 1: 300 solution of NIUIF-1 [see also *H.A.*, 23: 780] and dusting seed plants before and after storage with 50% TMTD gave good control of phomosis [*Phoma rustrupii*].

3892. REYNOLDS, H. W.
**Carrot yields increased in Arizona with soil fumigation.**
*Down to Earth*, 1954, **9** (4): 5, illus.

Ethylene dibromide (Dowfume W-85) at 4½ and 6 gal. per acre reduced nematode populations and considerably increased carrot yields.

3893. HARRINGTON, J. F., AND PRATT, H. K.
**Root fumigation.**
*Calif. Agric.*, 1954, **8** (7): 6.

In tests for nematode control in carrots and beet grown for seed, methods of sterilizing the roots at transplanting time were investigated. The roots were placed in a fumigating chamber at 68° F., containing methyl bromide, ethylene dibromide or ethylene chlorobromide. Rates of the fumigants varying between 1 and 4 lb. used for 2 hours appeared to be the maximum for safety, safe rates for carrot tending to be lower than those for beet. Some beet roots were reconverted into the vegetative state by the treatments. It is not yet known whether these maximum safe treatments will control nematodes.

3894. WRIGHT, D. W.
**Carrot fly [*Psila rosae*].**
*A.R. nat. Veg. Res. Stat. Wellesbourne for 1953*, 1954, p. 19.

Studies on the control of carrot fly showed that gamma BHC gave nearly perfect control of the first generation on early carrots. In the Isle of Ely experiments showed that, with the application of 2 oz. of 50% gamma BHC dust to 1 lb. of carrot seed, 11·6 tons of marketable roots per acre were produced as compared with 1·37 tons per acre on untreated plots. With carrots grown from gamma BHC-treated seed sown in June, however, protection against carrot fly was very incomplete.

3895. ORTH, H.
Zur Bekämpfung der Möhrenfliege (*Psila rosae* F.) mit Lindan-Präparaten. **(The control of carrot fly by lindane preparations.)**
*NachrBl. dtsch. PflSchDienst., Braunschweig*, 1954, **6**: 90-1, bibl. 2.

The application of an unnamed lindane preparation in the 6th week after sowing at the rate 10 g./m² reduced the incidence of *Psila rosae* by 93% in carrots sown mid-April and by 34% in plants sown early in May. Work on the timing of repeated treatments in the case of later sowings is in progress. No off-flavour occurred in carrots receiving several applications of lindane.—Biol. Bundesanst., Neuss-Lauvenburg.

3896. RAMSEY, G. B., SMITH, M. A., AND WRIGHT, W. R.
**Peronospora in radish roots.**
*Phytopathology*, 1954, **44**: 384-5, bibl. 3, illus.

The downy mildew fungus, *Peronospora parasitica*, is uncommon on radish roots but in 1953 and 1954 it caused serious losses in the Chicago district, discolouring radishes of the red globe type.—U.S. Dep. Agric., Chicago, Illinois.

3897. SCHEIJGROND, W., AND VOS, H.
**Investigation on the susceptibility to club root.** [Dutch summary 1 p.]
*Euphytica*, 1954, **3**: 125-39, bibl. 10, illus.

Studies were made on several aspects of club root (*Plasmodiophora brassicae*) attack on crucifers. Infected plant parts had a somewhat higher dry matter content and a higher N content in the dry matter than healthy parts; the sugar content was considerably lower. In a crop trial of several crucifers, no seedlings of Chinese radish were lost and this crop and kale were the least severely attacked, whereas rape, turnip and white mustard were very severely attacked. In a varietal trial with turnips the types half-long green top yellow, half-long purple top white, flat round yellow and round yellow-fleshed were less susceptible than varieties of other types. Two Belgian "immune" varieties tested, Meetjeslander and Waaslander, proved to be fairly resistant; other "immune" varieties, Weibulls Immune II and Ostersundom, were seriously affected by club root. The possibility of the existence of different physiological races of the disease is discussed.

3898. REDER, R., AND ODELL, G. V.
**Vitamin content of turnip-green plants in relation to growth.**
*Plant Physiol.*, 1954, **29**: 131-5, bibl. 8.

The vitamin concentration in leaf blades, midribs and roots of turnip (*Brassica rapa*) from 3 sources appeared to be characteristic for the variety and relatively unaffected by environment. With an increase in plant weight, variation in ascorbic acid, riboflavin, thiamine and carotene content was not significant over a period of 6 weeks. In midribs and roots the concentration of each of the vitamins decreased as the plants grew larger, and the decrease was statistically significant for each vitamin except carotene in the midribs, and thiamine in the roots. There was a marked change in the distribution of the whole plant content of ascorbic acid among plant organs, which followed rather closely the distribution of plant dry matter. In all experiments the total amount of each vitamin per plant was positively and significantly correlated with the total amount of plant dry matter.

3899. STITT, L. L.
**Insecticide tests for control of maggots in turnips.**
*J. econ. Ent.*, 1953, **46**: 961-5, bibl. 3, illus.

In western Washington aldrin and heptachlor dusts, applied in the furrow with the seed at 0·03 to 0·1 lb. active ingredient per 1,000 ft. row, gave the best control of *Hylemyia brassicae* maggots, injuring turnips. Broadcast or surface application was less effective than furrow treatment when equivalent amounts per crop acre were used. Residues in p.p.m. ranged from 0·231 to 0·439 for aldrin and nil to 0·078 for heptachlor. No off-flavour was detected in the treated turnips.

3900. NEILSON, C. L., AND KING, K. M.
**Maggots in [swede] turnips.**
*Ent. Circ. B.C. Dep. Agric.* **13**, 1954, pp. 3, illus.

Recent research has shown that maggots, mainly *Hylemyia brassicae*, can be effectively controlled in swedes by applying 2½% aldrin or heptachlor dust in a 10-inch band at the rate of 22 oz. per 100 ft. of row, followed by light raking and sowing the seed down the centre of the band. Control by spraying with aldrin and heptachlor also shows promise.

3901. DAVID, W. A. L., AND GARDINER, B. O. C.
**The systemic insecticidal action of certain compounds of fluorine and of phosphorus on *Phaedon cochleariae* Fab.**
*Ann. appl. Biol.*, 1954, **41**: 261-70, bibl. 3.

Schradan, dimefox (bis (dimethylamino) fluorophosphine oxide), paraoxon (diethyl paranitrophenyl phosphate) and acetate (sodium fluoroacetate) were tested against the mustard beetle, *Phaedon cochleariae*, on turnip plants. The order of toxicity to adults and larvae by a direct contact technique was paraoxon > acetate ≃ dimefox > schradan; paraoxon was very much more toxic than the other compounds, and in all cases adults were more resistant than the larvae. When the insecticides were applied systemically the order of toxicity was paraoxon > dimefox > acetate ≃ schradan, because the acetate caused wilting and the plants absorbed less. Both paraoxon and dimefox gave complete kills of adult *Phaedon* at practical concentrations; schradan and acetate were ineffective systemically against *Phaedon*.

### *Salad crops.*

(*See also* 3805.)

3902. BAKKER, M.
Proeven ter bestrijding van rotting van witlofwortels veroorzaakt door *Sclerotinia sclerotiorum* (Lib.) Massee. (**The control of rot in Brussels chicory roots caused by *Sclerotinia sclerotiorum.***) [English summary 17 lines.]
*Meded. Dir. Tuinb.*, 1954, **17**: 356-61.

Partial control of *Sclerotinia sclerotiorum* in forced chicory roots was obtained by sprinkling Fusarex (tetrachlornitrobenzene) on the roots in the forcing bed at 150 g. per square metre. An organic mercury compound, Aawitlo, used as a 0·25% solution, also gave partial control, but the subsequent high level of mercury in the plant rendered it dangerous as a food. Prevention of infection by cultural methods appears to be the best control.

3903. SORTEBERG, A.
Fortsatte forsøk med molybden. (**Further trials with molybdenum.**) [English summary pp. 3.]
*Forskn. Landbruk.*, 1954, **5**: 161-98, bibl. 33, illus.

In pot trials with peat soil to which a complete fertilizer, lime and molybdenum were added in different combinations and quantities, lettuce was the chief experimental plant. At a low rate of liming (pH 4·7) severe symptoms of Mo deficiency occurred, while applications of $(NH_4)_2MoO_4$ (1 kg./hectare) or moderate liming (pH 5·85) produced healthy plants. A decrease in yields caused by excessive liming (pH 7·7–7·8) was reduced and eliminated respectively by applications of $MnSO_4$ and $(NH_4)_2MoO_4$. In another series of experiments the effect of molybdenum on lettuce yields was found to decrease with the amount of irrigation water supplied (35, 65 and 95% of the water-holding capacity of the soil), the highest water rate giving normal yields in the absence of Mo. It is not clear whether the increase in yields associated with higher water applications was due to a rise in soil moisture or to the incidental rise in pH. The source of nitrogen was also shown to influence yields and the expression of Mo deficiency symptoms in lettuce, $(NH_4)_2SO_4$ being more beneficial than $Ca(NO_3)_2$ (unfavourable) and $NH_4NO_3$. The Mo content of lettuce subjected to different lime and $(NH_4)_2MoO_4$ treatments ranged between 0·05 and 3·80 p.p.m. In an experiment with cauliflower a solution of Mo was applied to the soil 3, 4 or 5 weeks after sowing; only the first application secured normal growth and yields. Other crops studied included carrot, parsley and beetroot.

3904. STUBBS, L. L.
**Lettuce mosaic virus disease.**
*J. Dep. Agric. Vict.*, 1954, **52**: 259-64, bibl. 5, illus.

Since 1951 lettuce mosaic virus has caused heavy losses amongst winter and spring maturing lettuces in Victoria. The use of locally produced seed in 1953 reduced the incidence of the disease. Recommendations are given for the reduction of losses from virus until sufficient quantities of local-grown, mosaic-free seed can be supplied.

3905. PADHI, B., AND SNYDER, W. C.
***Stemphylium* leaf spot of lettuce.**
*Phytopathology*, 1954, **44**: 175-80, bibl. 14, illus.

Brown circular leaf spots have been observed on all varieties of lettuce grown near the Californian coast; these are caused by *Stemphylium botryosum*, an imperfect stage of *Pleospora herbarum*. The disease is most prevalent in the rainy winter months. The fungus lives from crop to crop in dead lettuce leaves on the soil. The refuse from an infected crop should therefore be turned under.

### *Spinach.*

(*See also* 3956f.)

3906. Grütz, W.
Ertragsunterschiede zwischen chloridhaltiger und sulfathaltiger mineralischer Düngung beim Spinatbau. (**Differences in spinach yields resulting from the use of chloride- and sulphate-containing fertilizers.**)
*Z. PflErnähr. Düng.*, 1953, **62**: 239-43, bibl. 3.

In this long-term manurial trial the favourable effect of chloride-containing fertilizers on spinach yields noted in some years was outweighed by a reduction in yields in other years, especially in wet seasons. The difference, however, as between chloride and sulphate fertilizers was small, except when ammonium chloride was applied in addition to potassium chloride; in that case the drop in yield, as compared with that following sulphates, was considerable.—Tech. Univ., Berlin-Charlottenburg.

3907. Grütz, W.
Die Oxalsäure als Qualitätsfaktor beim Spinat (*Spinacea oleracea*). (**Oxalic acid as a quality factor in spinach.**)
*Z. PflErnähr. Düng.*, 1953, **62**: 24-30, bibl. 3.

Several manurial and other treatments tested failed to reduce significantly the oxalic acid content of spinach, and high nitrate applications were found to have an unfavourable effect. Oxalic acid content is lower in young than in old leaves.—Tech. Univ., Berlin-Charlottenburg.

### *Tomatoes, eggplants and capsicums.*

(*See also* 3350, 3357, 3402, 3407, 3409, 3410, 3522, 3674, 3860, 3955g, m, n, p, x, 3956o, p, 4448, 4475.)

3908. Carncross, J. W. [Editor].
***American Tomato Yearbook 1954.***
Westfield, N.J., 1954, pp. 36, $ 2.00.

The yearbook includes a list of references to articles on tomato culture since 1949, a table of grade requirements for canning and processing tomatoes, a list of agricultural experiment stations and State Directors, and tomato production statistics in the U.S.A. and Canada.

3909. C.S.I.R.O., Australia.
**Plant genetics.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, pp. 18-19.

Tomato breeding is aimed at combining resistance to spotted wilt, fusarium wilt and eelworm with desirable agronomic characters. The variety Rey de los Tempranos, which possesses a heritable resistance to spotted wilt, is being used. Six promising hybrids with nematode and fusarium wilt resistances have been produced.

3910. Highkin, H. R., and Hanson, J. B.
**Possible interaction between light-dark cycles and endogenous daily rhythms on the growth of tomato plants.**
*Plant Physiol.*, 1954, **29**: 301-2, bibl. 4, illus.

Tomato plants were grown in cycles varying considerably from 12 hours light and 12 hours dark. Plants receiving a total of 16 hours light but having the dark period interrupted by 2 hours of light showed significant growth inhibition in comparison with the control plants. Peas showed some growth inhibition at the 6 hours light/6 hours dark and 24 hours light/24 hours dark cycles.

3911. Naaldwijk.
Regeling van de grond temperatuur bij de opkweek van tomaten. (**Regulation of soil temperature for young tomato plants.**)
Invloed van temperatuur en licht op de phosphoropname door jonge tomatenplanten. (**The influence of temperature and light on the phosphorus uptake of young tomato plants.**)
*Jaarversl. Proefstat. Groent. Fruit Glas, Naaldwijk 1953*, pp. 31, 32.

In the first experiment soil temperatures were taken in pots of young tomatoes growing on various nurseries. It was shown that 15° C. was the most favourable temperature for satisfactory growth and that at temperatures lower than this insufficient P was absorbed by the roots. In the second experiment radio-active P was used: from solutions of mono-ammonium phosphate given at potting-up, plants with supplementary light absorbed double the amount of P absorbed by plants without extra light. Plants growing in soil with an average temperature of 18° C. had absorbed 80% more P 2 weeks after potting-up than plants growing in soil at 16·5° C. soil temperature.

3912. Naaldwijk.
Licht is leven. (**Light is life.**)
*Meded. Proefstat. Groent. Fruit Glas, Naaldwijk*, 1954, No. 7, p. 2.

Experiments at Naaldwijk with tomato plants sown at the end of October showed that plants receiving extra light between potting-up and planting out in soil with a temperature of 15·8° C., gave their first picking on 21 April, and produced 950 g. per plant in the succeeding month. Plants which received no extra light, but were planted out in soil of the same temperature, gave 610 g. per plant. Illuminated plants transplanted into soil of 17·5° C. started to crop a few days later and produced 560 g. per plant; with non-illuminated plants transplanted under similar conditions harvesting started about 7 May and 310 g. of fruit were harvested by 19 May.

3913. Crane, F. L.
**A light activated accumulation of niacin in tomato leaf disks.**
*Plant Physiol.*, 1954, **29**: 188-90, bibl. 7.

Analysis of tomato leaf discs showed that the niacin content increased in light either on a per disc or dry weight basis. The increase in niacin during the first 3 hours under several light intensities was the same at all values above 25 f.c. Sucrose did not cause niacin accumulation in the dark, nor did it increase the amount formed in light. After several hours' incubation in water baths at 26° C. and 37° C., at light intensity 75 f.c., the rate of niacin accumulation tended to decrease. The niacin content increased during the morning, and decreased during the afternoon and evening. Wounding caused by cutting the leaf discs appeared to have no effect on niacin concentration.

3914. Hassan, H. H., and McCollum, J. P.
**Factors affecting the content of ascorbic acid in tomatoes.**
*Bull. Ill. agric. Exp. Stat.* **573,** 1954, pp. 24, bibl. 41.

Tomato fruits exposed to direct sunlight were found to have a significantly higher ascorbic acid content than shaded fruits. Exposed fruit reached a peak in ascorbic acid content about the middle of the harvesting season and showed greater seasonal variation than shaded fruit. The uppermost fruits in greenhouse plants were highest in ascorbic acid content. Illumination had a cumulative effect on ascorbic acid throughout the green stage, and the acid content varied with the intensity of light reaching the fruit but was apparently not affected by light reaching the leaves in the field. [From authors' summary.]

3915. (Piringer, A. A., and Heinze, P. H.)
**Light link in tomato.**
*Agric. Res.*, 1954, **2** (12): 8.

Tomato fruit responds to as little as $\frac{5}{100}$ f.c. for an hour during the ripening period by the production of a flavenoid, which gives an orange shade to the final fruit colour.

3916. Bernstein, L., and Pearson, G. A.
**Influence of integrated moisture stress achieved by varying the osmotic pressure of culture solutions on growth of tomato and pepper plants.**
*Soil Sci.*, 1954, **77**: 355-68, bibl. 10, illus.

The influence of varying moisture-stress regimes having the same mean integrated stress on the growth of pepper and tomato plants was studied by means of water cultures adjusted to various pressures by the addition of NaCl. In the range up to 12 atmospheres growth of peppers was found to depend upon mean integrated stress regardless of stress distribution, but tomato plants showed a greater inhibition of growth when stresses in excess of 5 atmospheres contributed to the mean integrated stress than when the stress was 5 atmospheres or less at all times. The implications of these findings with respect to salt tolerance, drought resistance, and irrigation practices are discussed. Data on the mineral composition of tomato and pepper leaves confirm conclusions based on visual observations that moisture stress and not specific toxicity of sodium or chloride was responsible for diminished growth. [Authors' summary.]

3917. Nicolaisen, W., and Fritz, D.
Untersuchungen über den Wasserverbrauch unserer Gemüsearten. (**Studies on the water consumption of vegetables.**)
*Gartenbauwiss.*, 1954, **1***: 36-58, illus.

A long-term investigation on the effect of environmental factors on the water requirements of vegetables is being carried out at the Inst. f. Gemüseforschung, Tech. Hochschule, Hanover. The results discussed here concern the influence of temperature and nitrogen applications on the water consumption of tomatoes and dwarf beans. The experimental plants were grown in Mitscherlich containers filled with Fruhstorfer's standard potting soil [*H.A.*, 24: 620], the water being supplied by a wick from a dish on which the containers rest. The pots were kept in three different environments, viz. (1) in the open but protected from rain, (2) in a cold tomato house and (3) in a cucumber house. The water consumption per tomato plant in (1) and (2) was about 65 l. during the whole growing season and in (3) about 25% higher. The amount of water needed to produce 1 kg. of dry matter was 277 l., 300 l. and 438 l. in (1), (2) and (3) respectively. Six dwarf bean plants grown in a single container consumed less water than one tomato plant, largely owing to their shorter growing season, but the amount of water needed to produce 1 kg. dry matter was about the same in both species. In the case of tomatoes increased N applications resulted in larger plants and consequently in higher water requirements, though the amount of water needed to produce 1 kg. dry matter was reduced. The increase in dry matter produced per g. of nitrogen applied was 33–40 g., with a corresponding increase in yield. The response of beans and tomatoes to changes in temperature is also discussed.

3918. Kerr, E. A.
**The Bouyoucos moisture-meter in greenhouse tomato culture.**
*Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab., 1951-1952*, pp. 14-18, illus.

The best moisture level for greenhouse tomato culture has not yet been determined. When the soluble-salts level is about 70, it appears that water should be applied when the meter indicates between 70% and 90% available moisture rather than 40% as recommended for outdoor soils. In sandy soils the available moisture level must be kept higher than in clay soils. Rather frequent light irrigations interspersed with occasional heavy waterings are probably best. [From author's conclusions.]

3919. Parfenov, M.
**The depth of sowing tomato seed for cultivation without transplanting.** [Russian.]
*Sad i Ogorod*, 1954, No. 3, pp. 24-5.

On the basis of experiments conducted at Kherson with 8 tomato varieties raised by direct seeding, it is recommended that the seed of determinate-type tomatoes should be sown at a depth of 3 cm. and that of non-determinate-types at 5 cm.

3920. Efeĭkin, A. K.
**The vigour of plants raised from cuttings of different age.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1954, **95**: 191-3, bibl. 5.

A series of controlled trials was conducted, both outdoors and under glass, on tomato plants raised from cuttings taken from the basal part of the stem with the first permanent leaf and from above the first inflorescence, and on plants grown from seed. No significant differences were observed in the number of flowers and fruits produced or in the total yield, foliage weight, etc. In a small-scale field trial, however, a 9·2% yield increase was obtained from plants grown from cuttings as compared with those grown from seed.

3921. Street, H. E., McGregor, S. M., and Sussex, I. M.
**Effects of 3-indolylacetic acid and 3-indolylacetonitrile on the growth of excised tomato roots.**
*J. exp. Bot.*, 1954, **5**: 204-14, bibl. 11.

---

* New series. Vol. 18 appeared in 1945.

A description is given of growth inhibition by IAA and IAN on excised tomato roots cultured for 7 days in a modified White's medium. $5\times10^{-9}$ g./ml. IAA or $5\times10^{-6}$ g./ml. IAN caused about 50% inhibition of linear growth of the main axis. With IAA the decrease in the number of laterals closely parallels the decrease in linear growth of the axis; this latter decrease may be due to a decrease in cell length. With IAN reduction in linear growth of the main axis occurred at concentrations above $10^{-8}$, while the number of laterals did not increase until the concentration exceeded $10^{-6}$. IAN enhanced the frequency of the laterals, by shortening the cells of the main axis and decreasing the number of cells separating adjacent laterals; IAA either depressed or had no effect on lateral frequency.

3922. Šebánek, J.
Kyselina 2-,3-,5-trijodbenzoová jako vhodný stimulátor rostlin, zvláště rajčete, papriky a bramboru. **(2,3,5-triiodobenzoic acid as a suitable stimulator of plants, especially of tomato, capsicum and potato.)** [English and Russian summaries 1 p. each.]
*Acta Univ. Agric. Silvic. Brno, Ser. A*, 1953, No. 1/4, pp. 53-91, bibl. 66, illus.
Další příspěvek ke stimulačním účinkum kyseliny trijodbenzoové zvláště na jarní pšenici, na baklažánu a na jiřině. **(Further contribution on the stimulatory effects of triiodobenzoic acid, especially on spring wheat, egg plant and dahlia.)** [English and Russian summaries 13 lines each.]
*Ibidem*, 1954, No. 1, pp. 15-24, bibl. 11.

With tomatoes, the application of 2,3,5-triiodobenzoic acid [TIBA] in lanolin paste (0·5%) to the base of young stems gave a 53% yield increase, and to the stumps of the style induced parthenocarpy. On capsicums the treatment retarded vegetative growth, accelerated fruit maturity and almost doubled yields. When TIBA was applied to the pollen of *Impatiens balsamina* the rate of growth was retarded by 66%. The reaction of peas to treatment with this material is described in detail.

In egg plant, flower and fruit formation was accelerated by application of TIBA paste to the base of young plants, and in dahlia and phlox flower production was increased.

3923. Witte, K., and Marx, K.-H.
Vergleichende Versuche mit verschiedenen Wuchsstoffpräparaten im Gewächshaustomatenanbau. **(Comparative trials with growth substance preparations on glasshouse tomatoes.)**
*Gartenwelt*, 1954, **54**: 213-14, 220-1.

In the 1953 trials, carried out with the tomato variety Moneymaker, the proprietary growth substance preparations tested advanced cropping (main harvest 10–20 days earlier) and the proportion of top quality, early-picked fruits. There was no increase in total yields. [See also *H.A.*, 24: 513.]—Bonn Univ.

3924. Choudhri, R. S., and Gaur, B. K.
**Effect of certain phyto-hormones upon the sugar/acid ratio in edible tomato fruits.**
*Sci. and Cult.*, 1954, **19**: 559-61, bibl. 2.

Valentia tomatoes were sprayed with 3 growth substances at 1 and 10 p.p.m. The sugar/acid ratio was reduced slightly by indoleacetic acid at the lower concentration and increased by it at the higher; at both concentrations it was reduced considerably by indolylpropionic acid and increased by 2,4-D.—Hindu Univ., Banaras.

3925. Hayslip, N. C., and Forsee, W. T., Jr.
**A preliminary report on the use of nutritional sprays containing N, P and K in tomato production.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 92-7.

In 1952, 2 experiments were carried out with nutrient sprays on tomatoes. In the first experiment, Manasota tomatoes, growing under good weather conditions, showed no significant yield increase when treated with complete nutrient sprays. In the second experiment, which was started after heavy rainfall had caused soil leaching, tomato plants receiving a foliar spray of Nu-Green [urea] with a soil application of nitrate of soda-potash gave almost 3 times the yield of unfertilized plots. All other fertilized plots gave increases in yield compared with unfertilized plots.

3926. Raleigh, G. J.
**Some effects of various silicates, lime, and gypsum on growth of tomato plants in Western and Eastern soils at low levels of phosphorus nutrition.**
*Mem. Cornell agric. Exp. Stat.* **326,** 1953, pp. 18, bibl. 11.

Pot experiments with young Earliana tomato plants were made to determine the value of silicates in comparison with other materials in several soils of varying pH and in sand with low levels of phosphorus. Results showed that, in general, silicates had little effect in very P-deficient soils and in the same soils given high P applications, but had a considerable effect at intermediate but relatively low levels of P, and in soils slightly deficient in available P. Sodium silicate was nearly always more effective than potassium silicate. With some soils calcium silicate was as effective as sodium silicate, especially when used in larger quantities. There was a marked reduction in growth on a gravelly sand loam, pH 5·35, following the use of calcium carbonate. With applications of 330 lb. per acre of calcium carbonate to soils of widely varying pH, growth was significantly reduced in some instances when compared with controls, and in several instances when compared with silicates, the most notable exception being with a very acid soil of pH 4·80.

3927. Fiskel, J. G. A., Forsee, W. T., Jr., and Malcolm, J. L.
**Some manganese-iron relationships in tomato fruits grown on marl, peat and sand soils.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 159-66, bibl. 11.

Pot studies were made on Rutgers tomato plants grown in marl, muck [loam ?] and fine sand soils; manganese fertilizer materials at different rates and from different sources were used. On the marl and the loam fruit from plants showing manganese deficiency contained less than 0·4 p.p.m. of manganese and the Fe/Mn ratios were greater than 6. Neither deficiency was encountered on limed or unlimed fine sand soils. Manganous oxide in these soils and under these conditions was at least as satisfactory a source of manganese as manganous sulphate. Manganous dioxide and EDTA (a chelating agent) were less efficient sources. The iron content of the fruit was not greatly altered beyond the normal variability encountered when the rate of manganese was increased.

3928. Spencer, D.
**The effect of molybdate on the activity of tomato acid phosphatases.**
*Aust. J. biol. Sci.*, 1954, **7**: 151-60, bibl. 22.

The effectiveness of sodium molybdate as an inhibitor of tomato acid phosphatases was examined. Significant inhibition of cell-free dialysed extracts was obtained with as low as $10^{-7}$ M sodium molybdate. A range of substrates, including a number of glycolytic intermediates, was tested and all except glucose 1-phosphate were hydrolysed by tomato leaf phosphatase preparations. Hydrolysis was always inhibited by molybdate. The inhibition was competitive; $K_i=10^{-5}$M. A measure of the *in vivo* phosphatase activity of intact living roots was obtained by immersing roots in a solution of *p*-nitrophenyl phosphate, and measuring the rate of formation of *p*-nitrophenol in the external solution. Molybdate inhibited phosphatases in whole root systems and in cell-free root extracts to the same degree. From the data it is concluded that molybdate, at physiological concentrations, does inhibit the phosphatases of tomato *in vivo*, at least in tomato root cells, and that the inhibition of phosphatases is a possible metabolic function of molybdenum. [Author's summary.]

3929. Hewitt, E. J., and McCready, C. C.
**Relation of nitrogen supply to the molybdenum requirement of tomato plants grown in sand culture.**
*Nature*, 1954, **174**: 186-7, bibl. 5.

Tomato was chosen as the test plant for studying the relationship between nitrogen and molybdenum in the nutrition of crop plants other than brassicas. Although the Mo effect was evident in the case of all forms of N applied, severe symptoms of Mo deficiency appeared only in the nitrate and ammonium nitrate treatments, plants receiving nitrite, ammonium compounds or urea being practically symptomless. The authors conclude from their results that in the absence of nitrate chlorophyll production is independent of molybdenum supply and that molybdenum is essential for tomato. Full details of the work in progress at Long Ashton will be reported elsewhere.

3930. Terentjeva, M. V.
**Foliar nutrition of tomatoes.** [Russian.]
*Sad i Ogorod*, 1954, No. 6, pp. 27-8.

Four spray applications of N, P, K, Mg and ash and of a balanced solution of 14 macro- and micro-elements were made on tomatoes. The effect of treatments on yield, percentage of diseased fruit, and dry matter and vitamin C contents is tabulated. Best results were obtained with the balanced fertilizer, which produced the highest yield of good quality fruits.

3931. Williams, K. T., and Bevenue, A.
**Some carbohydrate components of tomato.**
*J. agric. Food Chem.*, 1954, **2**: 472-4, bibl. 19.

The free sugars, D-fructose, D-glucose, sucrose and a ketoheptose, accounted for 63% of the solids in peeled, ripe tomatoes. The polysaccharides, an arabangalactan mixture, a xylan-rich fraction, pectin and α-cellulose, accounted for 19% of the solids.

3932. Darby, J. F.
**Recent developments in the control of the major diseases of unstaked tomatoes grown on the sandy soils of south Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 103-7, bibl. 2, illus.

The 4 major foliage diseases attacking unstaked tomato plants growing on sandy soils of Florida are late blight (*Phytophthora infestans*), grey mould (*Botrytis cinerea*), bacterial spot (*Xanthomonas vesicatoria*) and grey leaf spot (*Stemphylium solani*). A recommended spray schedule is given. In fungicide trials phygon XL gave the most effective control of grey mould; excellent control of bacterial spot was obtained by streptomycin at the rate of 2 lb./100 gal. spray.

3933. Jacks, H., and others.
**Vegetable therapeutant trials in 1952-1953. Tomato diseases.**
*N.Z. Comm. Gdnrs' J.*, 1954, **9** (9): 4-6, 8-9, **9** (10): 3.

Experimental figures are tabulated in a progress report on vegetable therapeutant trials being carried out by the Plant Diseases Division, D.S.I.R., Auckland. In glasshouse tests on late blight of tomatoes (*Phytophthora infestans*) various spray materials were applied to Potentate 24 hours before artificial inoculation; bordeaux at 6-8 lb., dithane D-14-zinc sulphate-hydrated lime at 2-1-0·5 lb., and thirospray at 2 lb., all in 100 gal. gave complete or very good control without damage to the young plants. In 2 field tests against late blight on Adelaide Dwarf, cuprox at 5 lb. in 100 gal. sprayed every 14 days after planting out gave nearly complete control on the fruit without significantly affecting the yield; in a further test when spraying was delayed until 3 weeks after planting out, cuprox at 5 lb./100 gal. and bordeaux 6-8-100 gave clean fruit, with no yield reduction. In field tests with Kondine, cuprox at 5 lb./100 gal. sprayed 4 weeks after planting out, and then 8 times at 14-day intervals gave clean fruit, but a slightly lower yield; in a second experiment when spraying was started 3 weeks after planting out, with 5 sprays at 14-day intervals, phygon XL at 1 lb./100 gal. gave clean fruit and an increased yield, when compared with the control. In an experiment on phoma rot (*Phoma destructiva*) the tomato variety Winter King was kept free from disease until early May [N.Z.] by spraying with bordeaux; of subsequent treatments applied at 14-day intervals, bordeaux and thirospray gave the best results. Experiments to control tomato caterpillar (*Heliothis armigera*) on Kondine showed that DDD-25 at 0·5 lb./100 gal. sprayed 7 times at 14-day intervals, starting 4 weeks after planting, gave good control without affecting the yield. Experiments to control the looper caterpillar (*Plusia chalcites*) on Potentate showed that DDD-25, D-spray 50 and lead arsenate gave complete control, but reduced yields; on Adelaide Dwarf trimort at 1 pt./100 gal. and lead arsenate at 3·0 lb./100 gal. gave good control of the looper but somewhat reduced yields. Eight applications of materials containing gamma BHC to Potentate at 10- to 14-day intervals did not appear to affect the flavour adversely. Mature Potentate plants sprayed with phygon XL at 4, 2 and 1·5 lb./100 gal. showed severe damage on tender foliage; phygon XL at 1 lb./100 gal. gave slight damage. Thirospray applied at 8, 6, 4 and 2 lb./100 gal. did no damage.

3934. Spencer, E. L.
**Factors associated with crease-stem of tomato.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 121-4, bibl. 4, illus.

The symptoms of crease-stem, a physiological disease of tomato, are described. Field observations show that young plants receiving ample fertilizer are most susceptible. Experimental work so far indicates that rapidity of growth, nitrogen source, and calcium level acting together or separately have an important influence on crease-stem occurrence. [See also *H.A.*, 24: 1634.]

3935. Newell, J.
**Milk spray cured tomato mosaic.**
*Grower*, 1954, **41**: 1409, illus.

At the John Innes Horticultural Institution Potentate tomatoes, sprayed at 10-day intervals after planting out with milk diluted in 9 parts of water, showed about 5% infection with tomato mosaic virus. Normal infection with Potentate is about 95%.

3936. Sylvester, E. S.
**Yellow-net virus disease of tomato.**
*Phytopathology*, 1954, **44**: 219-20, bibl. 2, illus.

The symptoms of yellow-net disease of tomato are expressed as a bright yellow chlorosis of veins and veinlets of infected leaflets; these symptoms, however, decrease with age and disappear 4 to 6 weeks after the onset. On the variety Marglobe the incubation period varied from 11 to 31 days; *Myzus persicae* gave a low level (17%) of transmission. In spite of a similarity of symptoms with beet yellow-net virus there was no reciprocal infection between beet and tomato.

3937. Granits, J., and Janke, A.
Über die Bekämpfung von Pflanzenkrankheiten durch Antibiotika. I. In vitro-Versuche über die Wirkung verschiedener Antibiotika auf *Corynebacterium michiganense* und *Agrobacterium tumefaciens*. II. Versuche zur Bekämpfung der durch *Corynebacterium michiganense* bewirkten Tomatenwelke mittels Penicillins. III. Über die Bekämpfung des durch *Agrobacterium tumefaciens* verursachten Pflanzenkrebses mittels Antibiotika. **(On the control of plant diseases by antibiotics. I. *In vitro* experiments on the action of several antibiotics on *Corynebacterium michiganense* and *Agrobacterium tumefaciens*. II. Experiments on the control with penicillin of bacterial wilt of tomato caused by *Corynebacterium michiganense*. III. On the control of crown gall with antibiotics.)**
*Zbl. Bakt., Abt.* 2, 1954, **108**: 35-46, bibl. 12, 47-65, bibl. 4, and 66-75, bibl. 11.

I. Among other things it was found that, as regards *Corynebacterium michiganense*, a decrease in virulence was associated with a loss in sensitivity to penicillin and dihydrostreptomycin.
II. (1) A natural infection of tomatoes with the bacterial wilt pathogen, *C. michiganense*, was found to spread rapidly in the field. Transmission occurred by seed and through the soil, but apparently not by insect vectors. (2) Of the methods tested for artificial inoculation, cutting off the root tip and immersing the plant in a bacterial suspension gave the best results. (3) Outdoor plants proved more susceptible to natural infection and glasshouse plants to artificial inoculation. (4) In a study of the action of penicillin on tomato plants 500/OE/ml. was found to be the *dosis tolerata*; applications exceeding 1,000 OE/ml. caused irreversible damage and death. (5) The application of penicillin by spraying the leaves, especially the lower surface, yielded a higher level of the antibiotic in the plant than did absorption by the root or injection. (6) A 72- to 96-hour treatment with a penicillin solution of 500 OE/ml. of seedlings (in the pricking-out stage) from infected seed appears to be the most promising of the control measures tested. (7) Data are given on the translocation of penicillin in the tomato plant and in the seedling.
III Observations suggest that natural infection by *Agrobacterium tumefaciens* of *Pelargonium zonale* and *Helianthus annuus* occurs above ground level, probably through the movement of water and not the motion of the pathogen. In the case of *P. zonale* a rapid cure of crown gall was obtained by the external treatment of young tumours with stated dosages of dihydrostreptomycin, aureomycin or terramycin following the surgical removal of the proliferation tissue. A combination of this treatment with the absorption of the antibiotic by the root was also successful. Penicillin failed to give a response.—Bundesanst. f. Pflanzenschutz, Vienna.

3938. Volcani, Z., and Wahl, I.
**Bacterial soft rot on tomato fruits affected by the late blight fungus.**
*Phytopathology*, 1954, **44**: 274-5, bibl. 5, illus.

In Israel in 1951 rapid development of soft rot was observed in tomato fruits severely affected with late blight, *Phytophthora infestans*, after a change from cool to warm weather. Experiments showed that *Bacterium subtilis* may induce soft rot in injured tomatoes if temperatures are relatively high and that late blight infection makes possible the entry of the bacteria. Since high temperatures are inimical to the late blight fungus, neither late blight nor soft rot will develop in uninjured fruits at high temperatures, despite the fact that high temperatures favour the soft rot bacteria.—Agric. Res. Stat., Rehovoth, and Hebrew Univ., Jerusalem.

3939. Day, P. R.
**Physiologic specialization of *Cladosporium fulvum* in England and Wales.**
*Plant Path.*, 1954, **3**: 35-9, bibl. 5.

Isolates of *Cladosporium fulvum* were collected from areas in England and Wales and studied in culture. Six strains were identified which were equivalent to the Canadian races 1, 2, 5, 7, 8 and 9 as already classified. The occurrence is being met by further breeding work at the John Innes Institution.

3940. Fisher, D. E.
**Stem and fruit rot of outdoor tomatoes.**
*A.R. nat. Veg. Res. Stat. Wellesbourne for 1953*, 1954, pp. 15-16, bibl. 4.

Studies on stem and fruit rot of tomato caused by *Didymella lycopersici* show that it can be carried by seed and by old stakes. After seed dissection, both pycnidia and hyphae were found in the funicle region and immediately beneath the outer hairy seed coat. Tomato seed extraction by fermentation favoured the spread of the fungus; the fungus was killed by extraction with 20% washing soda and with 1·5% hydrochloric acid. Black nightshade (*Solanum nigrum*) could be readily infected with *Didymella* from tomato.

3941. Davis, D.
**The use of intergeneric grafts to demonstrate toxins in the fusarium wilt disease of tomato.**
*Amer. J. Bot.*, 1954, **41**: 395-8, bibl. 11, illus.

Scions of potato, tobacco, nightshade (*Solanum nigrum*), *Capsicum*, *Physalis* and tomato were grafted onto tomato stock var. Bonny Best; the plants were then inoculated with *Fusarium oxysporum* f. *lycopersici*. Disease symptoms in tomato scions on tomato stocks followed the same pattern as on inoculated ungrafted tomato plants. Vascular discoloration and leaf wilting appeared in the non-tomato scions, often before symptoms were apparent in the tomato stock. In these scions showing vascular discoloration and other symptoms the pathogen was not detected but it was always found in tomato tissues showing symptoms. The experiments indicate that a toxin is translocated in advance of the pathogen.

3942. Mostafa, M. A.
**Adventitious-root formation by fungal pathogen metabolites as a possible mechanism of disease resistance.**
*Nature*, 1954, **174**: 86-7, bibl. 2, illus.

Cut shoots of a wilt-resistant and a wilt-susceptible variety of tomato were tested for their ability to form adventitious roots in response to metabolites of 2 tomato-wilt *Fusarium* species, *F. oxysporum* and *F. moniliforme*. Adventitious rooting occurred in the resistant variety only. The possible significance of this is discussed.

3943. Young, P. A., and Pinckard, J. A.
***Sclerotium rolfsii* and its control with chlorobromopropene.**
From abstr. in *Phytopathology*, 1954, **44**: 334.

In tests in Texas in 1953 *Sclerotium rolfsii* killed 5% of the tomato plants in plots treated with 1·14 gal. (13 lb.) CBP in 100 gal. water per 100 sq. yds, 14% in plots treated with half that amount and 67% in the control plots.

3944. Isaac, I.
**Studies in the antagonism between *Blastomyces luteus* and species of *Verticillium*.**
*Ann. appl. Biol.*, 1954, **41**: 305-10, bibl. 6.

*Blastomyces luteus* was shown to be antagonistic to *Verticillium albo-atrum* and *V. dahliae* in culture at several temperatures between 10° and 30° C., and at pH values between 3·0 and 9·6. *B. luteus*, grown on Dox's and potato-dextrose solutions, produced an exudate which, added to agar media, had an inhibiting effect upon the growth of the 2 *Verticillium* species. "Spent" Dox's liquid medium, which had supported the growth of *B. luteus* and was injected into tomato and antirrhinum seedlings previously inoculated with *Verticillium*, had no therapeutic effect. *B. luteus* inoculated into the soil had a controlling effect on tomato and antirrhinum wilt only when planting was done 3 months or more after inoculation; when planting was done sooner, *B. luteus* had no effect on disease incidence, which suggests that the antagonistic organism and the pathogens need to co-exist in the soil for a sufficient period to allow the exudate of the former to influence the development of the latter.—Univ. Coll., Swansea.

3945. Olsen, K. L., and Thomas, N. F.
Efectividad de dos fumigantes del suelo y dos insecticidas contra el nematodo de las agallas de las raíces en tomates y okra. **Efficacy of 2 soil fumigants and 2 insecticides against the root-knot nematode in tomato and okra.)**
*Turrialba*, 1954, **4**: 23-8, bibl. 24.

Successful control of the root-knot nematode (*Meloidogyne incognita* var. *acrita*) attacking vegetable crops in Turrialba, Costa Rica, was obtained by soil fumigation with 30 gal. per acre of either Dow-fume W-40 (EDB) or D-D. The organism was not satisfactorily controlled by aldrin or parathion at the rates applied in these experiments.

3946. Leiderman, L., and Sauer, H. F. G.
A broca pequena do fruto do tomateiro, *Neoleucinodes elegantalis* (Guenée, 1854). **(The small tomato fruit borer, *Neoleucinodes elegantalis*.)**
*Biológico*, 1953, **19**: 182-6, bibl. 17.

Distribution, season and nature of attack, life cycle and control. Lindane, parathion and DDT show promise.

3947. Mohan Rao, M.
**A note on the grafting of *Solanum melongena* L. on *Solanum torvum*.**
*S. Indian Hort.*, 1954, **2**: 61.

Between 20% and 50% of patch buds, saddle grafts and side grafts of eggplant, inserted in December, formed unions with the hardy perennial *S. torvum* and matured normal fruits in February.

3948. Rosa, M.
La produzione delle melanzane con fumigazione al terreno. **(Eggplant culture in fumigated soil.)**
*Ital. agric.*, 1954, **91**: 395-400, illus.

Experiments were made at Salerno on the control of *Verticillium* and *Fusarium* wilt in eggplant crops planted in rows 60–80 cm. apart. Chloropicrin was injected into the soil at a depth of 17–20 cm. at 3 rates: (1) total fumigation—at 30–40 × 30–40 cm. throughout the field; (2) double-line fumigation—at intervals of 30–40 cm. in 2 lines astride the planting row; and (3) single-line fumigation—at 30–40 cm. along the planting row. Compared with the untreated control, total and double-line fumigation gave highly significant, and single-line a significant yield increase per plant and weight of individual fruit, and total fumigation gave a highly significant, and double-line a significant lower wilt rate. Costs of treatment and yield increases due to treatment are given.—Staz. Pat. veg., Rome.

3949. Tjutin, M. G.
**The melon pear.** [Russian.]
*Priroda*, 1954, **43** (3): 91-2.

The melon pear, *Solanum muricatum*, a herbaceous plant from South America, is cultivated in the Soviet Subtropics as an annual. It is propagated by cuttings taken in the autumn and rooted in cold frames. The plants spaced in the open at 75 × 100 cm. produce their succulent, seedless fruits in late autumn.

3950. Dale, W. T.
**Sap-transmissible mosaic diseases of solanaceous crops in Trinidad.**
*Ann. appl. Biol.*, 1954, **41**: 240-7, bibl. 17, illus.

Four sap-transmissible viruses were isolated from cultivated Solanaceae in Trinidad: tobacco mosaic virus from tobacco, tomato, and sweet pepper; cucumber mosaic virus from tobacco and petunia; pepper vein-banding virus from peppers and tobacco, causing leaf-crinkling and vein-banding in *Physalis floridana*, *Nicotiana* spp. and most peppers; and eggplant mosaic virus from eggplant and tomato, producing mosaic, ring-spotting or both. On *Chenopodium hybridum* eggplant mosaic virus gave local and systemic ring-spotting, and on cowpea it gave necrotic local lesions. The thermal inactivation point of pepper vein-banding virus is 62° C., and its longevity *in vitro* at 25–30° C. is 6 days; for eggplant mosaic virus the corresponding figures are 78° C. and 3 weeks. *Aphis gossypii* is the vector of cucumber mosaic and pepper vein-banding; *Epitrix* sp. is an occasional vector of eggplant mosaic.

3951. Bashir, C. M.
**Some pollination studies on chillies.**
*Agric. Pakistan*, 1952, **3**: 125-8, bibl. 4.

The yields from emasculated, artificially pollinated and untreated flowers were compared in pollination studies on *Capsicum annuum* at the Punjab Agricultural College and Research Institute, Lyallpur, in 1949. The results were: (1) no parthenocarpy occurred; (2) fruit set in July was 10% in artificially pollinated flowers compared with 8% in untreated flowers; (3) fruit set in artificially pollinated flowers rose from 10% to 25% after watering; (4) fruit set in artificially pollinated flowers rose from 5–6% in May and June to 85% in October and November. The main factor causing flower drop was high temperature combined with low relative humidity.

3952. McKeen, C. D.
**Inhibition of virus infections of certain plants by extracts from *Capsicum frutescens* L.**
*Science*, 1954, **120**: 229, bibl. 7.

Juice from sweet pepper plants (*Capsicum frutescens*) infected with cucumber mosaic virus (CMV), when rubbed onto leaves of indicator hosts, gave an average of 0·4 lesions, whereas inoculum from infected tobacco plants produced 150·6 lesions. When healthy pepper extract was added to CMV juice from tobacco and the mixture applied to cowpea, 7·9 lesions were produced; unadulterated CMV juice produced 220·7 lesions. Similar inoculations with ringspot virus from tobacco and cucumber showed that pepper extract almost completely inhibited lesion development on the host indicators. Tobacco etch virus in pepper sap produced relatively low lesion counts in *Physalis peruviana* in comparison with those produced by infected sap from tobacco; by adding pepper extract to infected tobacco sap, the lesion number was reduced 7- or 8-fold.

3953. Muntañola, M.
**A study of a newly identified pepper disease in the Americas.**
*Phytopathology*, 1954, **44**: 233-9, bibl. 37, illus.

*Cercospora unamunoi*, which causes defoliation in *Capsicum frutescens*, is recorded for the first time from Argentina, Brazil, El Salvador and Venezuela. The disease also occurs in the southern United States. [From author's summary.]—Nat. Univ. Tucumán, Argentina.

3954. Elmore, J. C., and Ranney, C. A., Jr.
**Injury to pepper plants by the pea leaf miner.**
*J. econ. Ent.*, 1954, **47**: 357-8, bibl. 2, illus.

Peppers, the cotyledons of which were severely damaged by *Liriomyza langei* in California, are not a normal host of the pest.

### *Noted.*

3955.

a Allard, R. W.
**Inheritance of some seed-coat colors and patterns in lima beans.**
*Hilgardia*, 1953, **22**: 167-77, bibl. 2, illus.

b Allard, R. W.
**Inheritance of four morphological characters in lima beans.**
*Hilgardia*, 1953, **22**: 383-9, bibl. 1, illus.

c Blank, B. B.
**Mechanised [mushroom] cropping in the United States.**
*Grower*, 1954, **41**: 1225-6.
The technique of composting used by a Michigan firm is described.

d Boswell, V. R.
**Modern varieties of vegetables.**
*Nat. hort. Mag.*, 1954, **33**: 96-112.
The best American varieties of many sorts discussed.

e Braun, O.
Gemüsebau in Hochbolivien. **(Vegetable growing in the highlands of Bolivia.)** [English, French, Spanish summaries.]
*Mitt. Klosterneuburg, Ser. B*, 1954, **4**: 122-6.

f Brenna, H. K., and Langvad, B.
Sortsforsøk med kruspersille. **(Parsley variety trials.)**
*Gartneryrket*, 1954, **44**: 311-13, bibl. 6, illus.

g Buckley, R., and Colthurst, J. P.
**The determination of O: O-diethyl O-*p*-nitrophenol thiophosphate residues in tomatoes.**
*Analyst*, 1954, **79**: 285-9, bibl. 9.
Separation and colorimetric determination of parathion.

h Bukowski, T.
**[Mushroom] growing in Poland.**
*Bull. Mushroom Grs' Ass.*, 1954, No. 55, pp. 233-5, illus.

Colhoun, J.
**Biological techniques for the evaluation of fungicides. III. The evolution of a technique for the evaluation of soil fungicides for the control of club-root disease of brassicae.**
*Ann. appl. Biol.*, 1954, **41**: 290-304, bibl. 7.

Corrales Macedo, A.
La cebolla. Aspectos de su cultivo en el pais. **(Onion growing in Peru.)** [English summary 1¾ pp.]
*Bol. Estac. exp. agric. La Molina* **52,** 1953, pp. 84, bibl. 25, illus.
Varieties, culture, storage, economics.

k Cox, J. A., and Montelaro, J.
**Grow snap beans.**
*Agric. Ext. Publ. La agric. Ext. Serv.* **1128,** 1952, pp. 6.
Varieties and cultural notes.

Crowley, N. C.
**Some variables affecting the use of cowpea as an assay host for cucumber mosaic virus.**
*Aust. J. biol. Sci.*, 1954, **7**: 141-50, bibl. 15.

m Diener, U. L.
**Host-parasite relations of the gray leaf spot disease of tomato.**
From abstr. in *Phytopathology*, 1954, **44**: 331-2.
*Stemphylium solani* invades the tomato leaf primarily through the stomata.

n Ehrenhardt, H.
Über die Wirkung des Hexachlorcyclohexans als systemisches Insektizid. **(On the action of BHC as a systemic insecticide.)**
Reprinted from *Anz. Schädlingsk.*, 1954, Vol. **27,** No. 1, pp. 5, bibl. 11.
The translocation of BHC in wheat and tomato plants is discussed.

o Endrigkeit, A.
Die Bekämpfung der Kohlfliege (*Chortophila brassicae* Bche.). **(Control of cabbage root fly.)**
*Z. PflKrankh.*, 1953, **60**: 593-9, bibl. 45.
A review of the relevant literature, mainly German.

p Fedotova, A. L.
**New forms of early maturing tomatoes.** [Russian.]
*Priroda*, 1954, **43** (6): 107-9, illus.
Obtained from progeny of the tomato variety Lučšii iz vseh [Best of All] grafted on *Solanum nigrum*.

q Fujii, T., and others.
**Ecological studies on cucumber varieties. I. Female flower formation in several varieties under various day-length and temperature conditions at Sapporo, Sendai and Matsudo. II. Ecological studies on cucumber varieties from the standpoint of their responses to day-length and temperature.** [Japanese, with English summaries 20 lines and ¾ p.]
*Res. Rep. Japan Minist. Educ.* **17,** 1954, pp. 1-5, 6-15, bibl. 6.
Temperature and photoperiod affected female flower production in most varieties.

r Hänsell, H.
Versuche zur Vererbung der Nodienzahl-Blühzeit-Relation im langen Tag bei Erbsensorten (*Pisum sativum* and *Pisum sativum* ssp. *arvense*). **(Studies on the genetics of the relationship between the length of time from germination to first flower and number of sterile nodes in peas under long-day conditions.)**
*Züchter*, 1954, **24**: 97-115, bibl. 32.
See also *H.A.*, 24: 2685.

s Hayter, C. N.
**Molybdenum deficiency of cauliflowers.**
*Rhod. Fmr*, April 23, 1954, p. 34, illus.

t Hofer, A. W.
**Description of a virus that destroys the root nodule bacteria of peas.**
*Soil Sci.*, 1954, **77**: 435-6, bibl. 12.

u Hozumi, K., and Ueno, Y.
**Spacing experiments on the growth of root vegetables.**
*Mem. Coll. Agric. Kyoto* **70,** 1954, pp. 20, bibl. 25.
Carrots, turnips and radishes in the field and in pots.

v Ilić, B.
*Ceuthorrhynchus suturalis* Fabr., malo poznata štetočina crnoga luka u Srbiji. **(*Ceutorrhynchus suturalis* F., a little known pest of onion in Serbia.)** [English summary ¾ p.]
*Zasht. Bilja*, 1954, No. 22, pp. 30-7, bibl. 8, illus.
Biology, damage, control with parathion.

w Jones, H. A., Peterson, C. E., and Franklin, D. F.
**Abundance: a new high-yielding storage-type hybrid onion.**
*Spec. Rep. Ia agric. Exp. Stat.* **6,** 1954, pp. 2, illus.
Performance and parentage are discussed.

x Kelbert, D. G. A., and Walter, J. M.
**Performance of new tomato types in the Gulf Coast area [Florida].**
*Proc. Fla St. hort. Soc. for 1953*, pp. 107-9.

y Lane, M. C., and Stone, M. W.
**Wireworms and their control on irrigated lands.**
*Fmrs' Bull. U.S. Dep. Agric.* **1866,** revised 1954, pp. 19, illus.
*Limonius californicus*, *L. canus*, *L. infuscatus* and *L. subauratus*.

z Lodewijks, N. C.
**"Snowdrift": a cauliflower variety for the Lowveld.**
*Fmg S. Afr.*, 1954, **29**: 317-18, illus.
A variety adapted to the mild and dry conditions of the Lowveld in winter.

3956.

a Mann, L. K.
**Fruit set in melon breeding.**
*Calif. Agric.*, 1954, **8** (7): 3.
For detailed account, see *H.A.*, 24: 443.

b MEHROTRA, B. S.
**The "cottony leak" of *Citrullus fistulosus* fruits.**
*Sci. and Cult.*, 1954, **19**: 564-5, bibl. 5, illus.
See *H.A.*, 24: 1558.

c MINISTRY OF AGRICULTURE, LONDON.
**Pea and bean beetles.**
*Adv. Leafl. Minist. Agric. Lond.* **126,** amended 1954, pp. 4, illus.

d MINISTRY OF AGRICULTURE, LONDON.
**Onion fly.**
*Adv. Leafl. Minist. agric. Lond.* **163,** amended 1954, pp. 3, illus.
*Delia antiqua* and its control.

e MINISTRY OF AGRICULTURE, LONDON.
**Turnip gall weevil.**
*Adv. Leafl. Minist. Agric. Lond.* **196,** revised 1954, pp. 4, illus.
*Ceutorrhynchus pleurostigma.*

f MINISTRY OF AGRICULTURE, LONDON.
**Cultivation of spinach.**
*Adv. Leafl. Minist. Agric. Lond.* **419,** 1954, pp. 4.
Spinach (*Spinacia oleracea*), spinach beet (*Beta vulgaris cicla*) and New Zealand spinach (*Tetragonia expansa*).

g RICADA, D.
Le maraichage au Maroc. (**Market gardening in Morocco.**)
*Rev. hort. Paris*, 1954, **126**: 1107-9, illus.

h RUSZKOWSKA, I.
Biologia szkodnika cebuli chowacza szczypiorowego *Ceuthorrhynchus suturalis* Fabr. (Col., Curculionidae). (**Observations on the biology of *Ceutorrhynchus suturalis* Fabr. (*Col.,* Curculionidae).**) [English and Russian summaries 2½ pp. each.]
*Ann. Univ. Mariae Curie-Skłodowska, Sect. E*, 1952, **7**: 417-71, bibl. 28, illus.
Attacking onions in Poland.

i SCHMIDT, E., Jr.
Les perches de haricots en fil de fer galvanisé ont été éprouvées. (**Galvanized iron supports for beans.**)
*Rev. hort. suisse*, 1954, **27**: 234-5, illus.

j SHISA, M., AND OTHERS.
**Ecological studies on cruciferous greens and turnip varieties.** [Japanese.]
*Res. Rep. Japan Minist. Educ.* **17,** 1954, pp. 55-70.

k STARR, G. H., WALTERS, H. J., AND BRIDGMON, G. H.
**White mould (*Sclerotinia*) of beans.**
*Bull. Wyo. agric. Exp. Stat.* **322,** 1953, pp. 11, illus.

l WALKOF, C.
**Vegetable hybrids and varieties developed and introduced by the Experimental Station, Morden, Man. from 1944 to 1951 inclusive.**
[*Publ.*] *Canad. Dep. Agric. exp. Fms Serv.*, 1952, pp. 11, illus.
Tomato, pea, cabbage and pepper varieties suitable for prairie conditions.

m WELLESBOURNE.
*4th Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick, 1953,* 1954, pp. 46.
See separate abstracts.

n WHITNER, B. F., Jr., AND OTHERS.
**Cantaloupes in Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 100-3.

o WILCOX, J., AND HOWLAND, A. F.
**The tomato russet mite.**
[*Mim.*] *U.S. Dep. Agric., Ent. Res. Branch* **E-876,** 1954, pp. 5, bibl. 14.
*Vasates lycopersici.*

p WILSON, W. F., COX, J. A., AND MONTELARO, J.
**Louisiana okra.**
*Ext. Publ. La Div. agric. Ext.* **1141,** 1953, pp. 11, illus.
*Hibiscus esculentus* for processing and fresh market.

## TOBACCO.

### *General.*

(*See also* 4003b, c, e, 4486-4489, 4494h.)

3957. C.S.I.R.O., AUSTRALIA.
**Tobacco, and tobacco chemistry.**
*A.R. C.S.I.R.O., Aust., 1952/53,* 1953, pp. 22-3.

*Leaf quality:* at Clare in Queensland investigations into the effect of N manuring and plant spacing on leaf quality showed that the highest yield of good quality tobacco was obtained with 16 lb. N per acre. There was a trend towards highest yield at 20-inch spacing; at 15-inch spacing the quantity of leaf that cured green was greatest. Although quantity and quality per acre were reduced by wider spacing the yield per plant was increased. *Varieties and disease resistance:* the effect of temperature on the resistance of tobacco plants to mosaic is being studied at Canberra. At temperatures above 75° F. inoculated plants were severely affected and usually killed by vascular necrosis. *Diseases and disorders:* cuttings from plants showing yellow dwarf or frenching showed a 50% reduction in rooting. *Studies on plant sugars:* qualitative studies have shown a large fluctuation in relative proportions of hexose and pentose sugars; under conditions of environmental strain or disease pentoses may accumulate and some tobacco samples have been obtained containing 2% arabinose.

3958. DELHI, ONTARIO (VICKERY, L. S.).
*Progress Report Dominion Experimental Station, Delhi, Ontario,* 1946-52, pp. 39.

Tobacco investigations at Delhi during the years 1946-52 have concerned the following: effect of rainfall and other weather conditions, soil moisture, seedbed management, flue-cured varieties, breeding and selection of new varieties, rotations, soil suitability, fertilizers including the use of starters and provision of organic matter, cultural practices including weeding, sucker control, etc.

3959. RETIEF, D. F.
**Tobacco research.** [Forming part of the Annual Report of the Secretary for Agriculture, Union of South Africa, for the year ending 31 August, 1953.]
*Fmg S. Afr.*, 1954, **29**: 91-3.

Research for the year 1952/53 included: *Agronomy:* For Orinoco tobacco, a mixture of 72 lb. N, 140 lb. P, and 120 lb. K gave the best yields over a 5-year period; noritic and alluvial soils appeared to be equally productive; most satisfactory sterilization of seedbeds was by steam under high pressure; a layer of vermiculite broadcast over the seedbed improved germination under dry conditions. *Plant breeding:* An $F_1$ hybrid from Yellow Mammoth × Vamorr tobacco is very promising; further selections of varieties and strains resistant to mildew are being made. *Chemistry and Physiology:* Studies included the uptake of radioactive P, analysis of tobacco samples from various regions, changes in free amino acids during curing, the effect of trace elements and the use of oils to suppress suckers. *Entomology and plant pathology:* Systemics were less effective than soil fumigants in controlling eelworm; Karathane (Iscothan) gave excellent control of mildew.

3960. ISTITUTO SCIENTIFICO SPERIMENTALE PER I TABACCHI.
Relazione tecnica 1953. **(1953 technical report [of the Tobacco Scientific Experiment Station].)**
*Tabacco*, 1954, **58**: 143-73.

*Agronomy section.* Chief varieties studied: Maryland, Burley, Virginia Bright, shade-grown subtropical wrapper tobacco, Turkish tobacco. Varietal trials, breeding and selection, sowing in sand culture, green manuring and fertilizer practice, mechanized cultivation, temperature sums and biological cycle studies, nicotine content. *Genetics and Physiology section.* Physiology: osmotic pressure in relation to manuring, drought resistance, inflorescence studies, root growth promoting substances, ascorbic acid content, *Cyperus rotundus* control, effect of maleic hydrazide. *Pathology section.* Oidium, viruses, apical and marginal scald, wild fire, deficiency diseases. *Entomology section.* Control of wireworms, *Pentodon punctatus*, *Heterodera marioni*, *Lasioderma serricorne*, *Ephestia elutella*, and aphids. Disinfection of stored tobacco. *Chemistry section.* Water consumption, enzymatic modulus, physiology and biochemistry studies, lime deficiency, curing, nicotine (colorimetric determination, biological function, and content), growth rate of Turkish tobacco, leaf humidity determination, pH and refractive index in sap of green tobacco and in dry tobacco extract. *Technology section.* Moulds attacking cloth for shade-grown tobacco, *Debaryomyces nicotianae*, fermentation studies, curing, water balance.

3961. PATEL, M. S., AND PILLAI, P. N. B.
**Jaffna tobacco.**
*Indian Tobacco*, 1954, **4**: 15-22, illus.

Jaffna chewing tobacco: production in India, chief varieties grown in Madras which is the principal producing area, and cultural practices in the Jaffna district of Ceylon.

### *Breeding and varieties.*

(*See also* 4003a, 4482.)

3962. RAEBER, J. G.
**Current experiments to produce improved varieties.**
*Rhod. Tobacco*, 1954, No. 5, pp. 26-7, illus.

Breeding projects at Kutsaga Research Station, Southern Rhodesia, include the improvement of quality of Vamorr 50 by crossing with Hicks and Delcrest, combining the superior yielding capacity of Virginia Gold with the high quality of Delcrest, and breeding for resistance to root knot and white mould.

3963. SCHMID, K., AND ORBECK, K.
Über den Entwicklungsstand der Virgin-Züchtung, sowie über Ernte und Trocknung von Virgin D. **(On the breeding of Virginia tobacco [in Germany] and on yields and curing of Virginia D.)**
*Dtsch. Tabakb.*, 1953, **33**: 141, from abstr. in *Züchter*, 1954, **24**: 155.

The breeding work at the Bundesanstalt fur Tabakforschung, Forchheim, Germany, is discussed. Its aim is the production of Virginia-type tobacco varieties for cultivation in Central Europe.

3964. REISCH, W.
Über die Bedeutung des Heterosiseffektes bei Tabak-Kreuzungen. **(On the significance of the heterosis effect in tobacco crosses.)**
*Tabak-Forsch.*, 1953, Sonderheft, p. 27, from abstr. in *Züchter*, 1954, **24**: 153.

A heterosis effect was shown to exist in certain tobacco crosses producing yield increases of up to 17%. The nicotine content of the hybrids did not exceed that of the parents.

3965. KOELLE, G.
Über die Beziehung zwischen Polyploidie und Alkaloidgehalt einiger *Nicotiana*-Arten. **(On the relation between polyploidy and alkaloid content in some *Nicotiana* species.)**
*Tabak-Forsch.*, 1953, Sonderheft, p. 32, from abstr. in *Züchter*, 1954, **24**: 152.

Tetraploidy was shown to have no direct influence on the alkaloid content of plants of several *Nicotiana* species.

3966. PUZZILLI, M.
L'azione della colchicina sullo sviluppo delle plantule di alcune specie di *Nicotiana*. **(The effect of colchicine on development in seedlings of some *Nicotiana* species.)**
*Tabacco*, 1954, **58**: 127-9.

In tests at Perugia University 0·5% colchicine solution inhibited growth and caused deformation in the seedlings of 3 tobacco varieties but had no effect on the viability or rate of germination of the seeds.

3967. PAZOURKOVÁ, Z.
Statnost a ranost u tabáku při křížení mezí odrůdami. **(Vigour and earliness in tobacco crosses.)** [Russian and German summaries 1¼ pp. each.]
*Preslia*, 1952, **24**: 221-34, bibl. 37.

When 4 tobacco varieties were crossed increases in earliness were obtained. The yield, particularly of $F_1$ hybrids, was considerably greater than that of the control plants. The hybrids were also more resistant to mosaic virus than the parents.

3968. Fardy, A., Schwartz, D., and Cuzin, J.
La nicotinogenèse chez *Nicotiana tabacum* L. Résultats obtenus par la téchnique des micro-greffes et la culture de radicules d'embryons. **(Nicotine biosynthesis in *Nicotiana tabacum.* Results obtained by micro-grafting and embryo culture.)**
*Ann. Inst. Exp. Tabac Bergerac*, 1953, **1**: 107-27, from abstr. in *Bol. Inst. Invest. agron. Madrid*, 1954, **14**: 307-8.

Nicotine biosynthesis was studied in the embryo and seedling of *Nicotiana tabacum* by micro-grafting radicles on *Physalis* and tobacco and by embryo culture. There were found to be 2 phases. In the first nicotine was synthesized at the growing point of the radicle. In the second it was translocated to the hypocotyl where it changed in form.

## *Cultural practices.*

(*See also* 3786.)

3969. Berezowski, B.
Wpływ różnych odstępów sadzenia Virginii Joyner na plon i jakość surowca tytoniowego. **(Effect of spacing on the yield and quality of Virginia Joyner tobacco.)**
*Roczn. Nauk rol., Ser. A*, 1953, **67** (2): 116-17.

Planting tobacco 20 cm. apart in rows 50 cm. apart resulted in the highest yields and best quality leaf, but wider spacings increased nicotine content. A spacing of 50 × 60 cm. required considerably less labour per hectare.

3970. Djadjučenko, P. M.
**Planting *Nicotiana rustica* in groups on the square.** [Russian.]
Demkevič, S. N.
**An evaluation of the method of planting tobacco in groups on the square.** [Russian.]
*Tabak*, 1954, **15** (2): 53-4 and 54-5 respectively.

Growing tobacco in groups of 2 at a distance of 60 × 60 cm. resulted in equal or better yields than when plants were spaced 30, 35 or 40 cm. apart in rows 60 cm. apart, and permitted completely mechanical cultivation, thus reducing production costs.

3971. Pal, N. L., and Kadam, B. S.
**Suppression of suckers by coconut oil and its effect on yield in tobacco.**
*Indian Tobacco*, 1954, **4**: 7-13, bibl. 7, illus.

Topping and suppression with coconut oil of the 5 topmost buds of flue-cured tobacco gave a significantly greater yield, without affecting the quality, than non-topping.

## *Nutrition and irrigation.*

3972. Ferrer, L. G.
**Preliminary test on the effect of ammonium sulphate on the production of shade-grown wrapper tobacco at Sta. Barbara, Pangasinan Province.**
*Philipp. J. Agric.*, 1954, **17**: 139-51, bibl. 13, illus.

The application of ammonium sulphate to shade- and sun-grown Simmaba wrapper tobacco caused significant increases in plant height, leaf length, leaf width, leaf thickness, number of standard leaves, internode length and stem circumference. The fertilized shaded plot gave a higher total yield and a higher wrapper yield than the corresponding unfertilized plot, but the percentage wrapper was the same in both cases. The fertilized unshaded plot gave a higher yield than the corresponding unfertilized plot, but neither plot gave any wrapper quality leaf. The exclusive use of ammonium sulphate for fertilizing shade-grown wrapper tobacco is not recommended.

3973. Lyneham, A. J. E.
**Fertiliser application for tobacco seed beds.**
*J. Agric. W. Aust.*, 1954, **3**: 375-6.

In 1953 a fertilizer trial was conducted on tobacco seedbeds to determine the optimum rate of application of a 3·8: 15: 6 NPK fertilizer. The soil was a loamy-sand virgin bush soil, and the fertilizer was applied 9 days before sowing. A rate of 4 lb. per square yard gave the largest number of healthy seedlings at the earliest date.

3974. Volk, R., and McAuliffe, C.
**Factors affecting the foliar absorption of $N^{15}$ labeled urea by tobacco.**
*Proc. Soil Sci. Soc. Amer.*, 1954, **18**: 308-11, bibl. 15, illus.

Single leaves of Dixie Bright 101 tobacco plants, grown in sand culture in the greenhouse, were sprayed with $N^{15}$ labelled urea. Out of 15 mg. of N applied up to 5 mg. was absorbed by the leaf within 24 hours, and after 6 hours a portion of this N had been translocated to every plant part. One-half of the absorbed N was translocated from the sprayed leaf within 24 hours, chiefly to adjacent leaves, the meristem and root. The absorption of urea through the upper and lower leaf surfaces was almost identical; the percentage of urea absorbed by lower leaves was greater than that absorbed by the upper leaves, except for the uppermost leaves; very young plants absorbed more urea than more mature plants, although leaf maturity generally had little effect. The absorption of urea was increased tenfold by brushing and thus damaging the epidermal hairs, so enabling the solution to come in direct contact with the epidermal cell wall. Absorption of urea over a 4-hour period was found to be 3 to 10 times greater by night than by day. Absorption was 3 times greater in the morning than in the afternoon. The absorption of urea from a phosphate buffer solution was increased as pH increased from 6 to 8. Urea absorption went down with an increase of sucrose solution in the urea spray; a 1 molar sucrose solution decreasing absorption by half.—N.C. agric. Exp. Stat., Raleigh.

3975. Noguchi, Y., and Sugawara, T.
**On the absorption and assimilation of foliar-applied urea.**
*Science* [*Japan*], 1952, **22**: 386-90, English abstr. in *Rec. Res., Fac. Agric. Univ. Tokyo 1952-1953*, 1954, No. **III**, p. 1.

Twenty-four hours after a 0·1 N urea solution had been sprayed on tobacco leaves, a darkening in the green colour indicated that urea absorption had occurred, probably taking place through the cuticle. Analysis of the leaves showed an increase in content of all N compounds, especially of free amino acids. Leaves of plants kept in the dark after spraying showed injury, which disappeared when a sugar solution was applied; carbohydrates are therefore presumed to supply energy for N assimilation.

3976. Vittorio, P. V., Krotkov, G., and Reed, G. B.
**Incorporation of $C^{14}$ into various carbohydrates of tobacco leaves after different periods of photosynthesis in $C^{14}O_2$.**
*Science*, 1954, **119**: 906-8, bibl. 3.

In experiments at Queen's University, Kingston, Ontario, photosynthesis took place in tobacco leaf discs supplied with 5% $C^{14}O_2$ for various periods up to 6 hours. $C^{14}$ appeared in the starch fraction before it did in the sugars. Total activity was higher at first in the starch fraction, but became higher in the sugars after 30 minutes and was again higher in the starch after 3 hours. Up to 3 hours the specific activity of the starch was consistently higher than that of the sugars, but at the end of 6 hours the specific activities of the starch, the sucrose and the free glucose plus fructose were all about equal. At this time the specific activities of the carbon in the starch and sugars were approximately equal to that of the carbon fed. Radioautographs show that specific activity first occurred in sucrose and only later in fructose and glucose.

3977. Volodarskiĭ, N. I., and Bykovskaja, I. P.
**The influence of variable soil moisture on leaf formation in tobacco during different phases of development.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1954, **95**: 187-90, bibl. 9.

Leaf growth and final yields were studied in tobacco grown in pots under different soil moisture conditions during its 3 phases of development. The first, so-called vernalization phase, lasts from transplanting to the formation of 16–18 leaves, the second, including the so-called light phase, ends with the appearance of central flower buds, and the third with harvest. The effect of soil moisture during the second phase was found to be the most critical, and when plants were grown at 40% saturation during the first phase, 40% during the second and 90% during the third, yields were considerably reduced. Plants grown at 90% soil moisture content throughout produced ample leaves, but yields were slightly increased when the moisture content was reduced to 40% in the third phase, and the highest production was obtained when tobacco was grown at 40% soil moisture content during the first phase and thereafter at 90%.

3978. Dalrymple, J. L.
**Tobacco grown with spray irrigation.**
*Rhod. Tobacco*, 1954, No. 5, pp. 22-3, illus.

Notes are given on a successful experiment by a grower in the Enterprise district of Southern Rhodesia on spray irrigation (electrically operated) of Bonanza and Delcrest. The equivalent of 22 in. rainfall was given. Methods, yields and economics are discussed.

3979. Kramer, P. J., and Jackson, W. T.
**Causes of injury to flooded tobacco plants.**
*Plant Physiol.*, 1954, **29**: 241-5, bibl. 9.

Tobacco shows 2 types of reaction to soil flooding. Severe wilting may occur within an hour or two, but the plants recover with prompt drainage. If, however, the soil remains saturated for more than 24 hours, permanent injury occurs and the plants yellow and finally die. The initial wilting is caused by a sudden decrease in the permeability of the roots to water; prolonged flooding causes death of the roots as the result of insufficient aeration, and this is aggravated by the action of micro-organisms. Wilting and injury to flooded plants can be prevented by forced aeration.

### *Diseases.*

(*See also* 3810, 3863, 3866, 3950, 4003d.)

3980. Nettles, W. C., and Lewis, J. M.
**Tobacco insects and diseases—South Carolina.**
*Bull. S.C. agric. Exp. Stat.* **109**, revised 1954, pp. 54, illus.

Notes on fungal, bacterial and virus diseases, nutritional disorders and insect and nematode pests in the nursery and the field, and on their control.

3981. Jeener, R., Lemoine, P., and Lavand'homme, C.
Détection et propriétés de formes du virus de la mosaïque du tabac dépourvues d'acide ribonucléique et non infectieuses. **(Detection and properties of forms of tobacco mosaic virus which are non-infectious and contain no ribonucleic acid.)** [English and German summaries 7 and 9 lines respectively.]
*Biochim. biophys. Acta*, 1954, **14**: 321-34, bibl. 15, illus.

The form of 2 non-infectious proteins, found in tobacco plants in which a systemic infection due to mosaic virus has developed, is described, and their possible roles as virus precursors are discussed.

3982. Humphries, E. C., and Kassanis, B.
**Effect of a dark period on susceptibility of leaves to infection.**
*A.R. Rothamsted exp. Stat. 1953*, 1954, pp. 72-3.

The number of necrotic local lesions produced by tomato aucuba mosaic virus on tobacco leaves increased if the plants were kept in darkness before inoculation, the effect increasing with lengthening of the dark period up to 9 days. When returned to daylight before inoculation the number of lesions decreased with increase of the light period. This lesion count variation is positively correlated with changes in the nitrate content of the leaf lamina and also water content. Variation in nitrate content induced by fertilizer had no effect on lesion count. [See also *H.A.*, 23: 4354.]

3983. Gondo, M.
**Further studies on transpiration in mosaic-diseased tobacco plants.** [Japanese, with English summary 11 lines.]
*Bull. Fac. Agric. Kagoshima Univ.*, 1953, No. 2, pp. 71-4, bibl. 9.

In tobacco plants grown in water culture the transpiration rate of diseased plants differed little from that of healthy plants for a month after inoculation and was significantly lower thereafter. Evidence from this experiment and from previous work on cut leaves suggests that the leaf blade plays a far greater part than any other parts of the plant in transpiration.

3984. Adsuar, J., Amy, A. S., and López-Matos, L.
**The effects of the mottle and the common mosaic viruses on the yield of variety Virginia 12.** [Spanish summary 10 lines.]
*J. Agric. Univ. Puerto Rico*, 1954, **38**: 105-7, bibl. 2.

In an experiment at Caguas the yields per acre of healthy, mottle-infected and TMV-infected Virginia 12 plants were 9·54, 6·15 and 6·16 cwt. respectively.

3985. Schlegel, D. E., and Rawlins, T. E.
**Inhibition of tobacco mosaic virus by an antibiotic from an actinomycete, *Nocardia* species.**
*Phytopathology*, 1954, **44**: 328-9, bibl. 4.

MK61, obtained from *Nocardia* sp., was the most effective of the antibiotics tested for inhibiting TMV multiplication in floating leaf discs.—Dep. Plant Path., Univ. Calif., Berkeley.

3986. Allington, W. B., and Laird, E. F., Jr.
**The infection of *Nicotiana glutinosa* with tobacco mosaic virus as affected by potassium nutrition.**
*Phytopathology*, 1954, **44**: 297-9, bibl. 5.

In the investigation described low potassium nutrition increased the tendency for *Nicotiana glutinosa* plants to become infected with tobacco mosaic virus.—Nebraska agric. Exp. Stat., Lincoln.

3987. Wynd, F. L.
**Preparation of radioactive tobacco mosaic virus.**
*Lloydia*, 1953, **16**: 233-51, bibl. 15, illus.

Tobacco seedlings were grown in a hydroponic culture low in P, the apparatus used for the purpose being described and illustrated. After 3 weeks radioactive P in the form of orthophosphoric acid was added to the nutrient solution and 7 days later each plant was inoculated with TMV. Sixty-two days after inoculation the plants were harvested and the virus recovered by differential ultra-centrifugation. A purified virus suspension was obtained showing a radioactivity significantly greater than that reported by other workers. The literature on the subject is also reviewed in some detail.—Mich. St. Coll., East Lansing, Mich.

3988. Mandryk, M.
**Suppression of rooting of tobacco cuttings by yellow dwarf virus.**
*J. Aust. Inst. agric. Sci.*, 1954, **20**: 50-1, bibl. 4.

Experiments with tobacco stem segment cuttings have shown the presence of leaves to be essential to rooting. Cuttings from healthy plants formed more and better roots than cuttings from plants infected with yellow dwarf virus. Cuttings from old plants did not root so well as those from young plants. Treatment with indolebutyric acid did not increase the percentage of healthy or diseased cuttings rooting, but increased the number of roots formed and their vigour. The comparatively poor rooting of the cuttings from yellow dwarf plants may be attributed to their high carbohydrate and low nitrogen contents.

3989. Johnson, E. M., and Valleau, W. D.
**Heterothallism in *Phytophthora parasitica* var. *nicotianae.***
*Phytopathology*, 1954, **44**: 312-13, bibl. 11, illus.

The appearance of black shank at different times in widely separated areas in Kentucky, its occurrence after 20 years and at a great distance from Georgia where the disease was first reported in the U.S., the comparatively slow build-up of the disease to destructive proportions, the inability to attribute many new outbreaks to the introduction of the pathogen by the usual methods (water, man, tools, etc.) suggest the independent origin of the pathogen, in new isolated outbreaks, by hybridization or otherwise from *Phytophthora* already present. That there are different strains of the pathogen, presumably of different origin, and that hybridization occurs between different isolates of the black shank pathogen is shown in the studies herein reported. [From authors' summary.]—Ky agric. Exp. Stat., Lexington.

3990. Todd, F. A., and Lucas, G. B.
**The role of plant-bed soil treatments in the control of tobacco black shank.**
From abstr. in *Phytopathology*, 1954, **44**: 333.

The main results and conclusions from the experiments described were: (1) the presence of black shank (*Phytophthora parasitica* var. *nicotianae*) infection in plant-bed soil is not of critical importance if the resistant Dixie Bright 101 variety is used; (2) treatment of infected soil with 0·09 lb. methyl bromide per sq. yd. gives complete control.

### *Pests.*

(*See also* 3676.)

3991. Graham, T. W.
**The tobacco stunt nematode in South Carolina.**
From abstr. in *Phytopathology*, 1954, **44**: 332.

*Tylenchorhynchus claytoni* is widespread in eastern South Carolina. It causes stunted top growth and retards root development.

3992. Dominick, C. B.
**Insecticide tests for tobacco flea beetle control.**
*J. econ. Ent.*, 1954, **47**: 346-9, bibl. 2.

In plant beds, DDT spray and CS-708 dust gave slightly better control of tobacco flea beetle, *Epitrix hirtipennis*, than 4 other materials used. In newly set tobacco dieldrin as a spray and 5% DDT dust had the longest residual action. Preliminary tests with the systemic insecticides demeton and G-23611 used in the transplant water showed some promise. On field tobacco 5% DDT and 2% isodrin dusts gave the longest residual protection among dusts tested. In low-volume spray tests, endrin was better than TDE.

3993. Guthrie, F. E.
**Laboratory studies on the toxicity of thirteen insecticides to the tobacco hornworm.**
*J. econ. Ent.*, 1954, **47**: 215-18, bibl. 10.

Both as contact poisons and as stomach poisons endrin, parathion and isodrin were most effective against tobacco hornworm, *Protoparce sexta*.

3994. Chamberlin, F. S.
**Insecticides for tobacco budworm control on shade-grown tobacco.**
*J. econ. Ent.*, 1954, **47**: 172-3, bibl. 3.

In trials in Florida weekly applications of dusts containing 10% of DDT or TDE gave the most satisfactory control of tobacco budworm, *Heliothis virescens*, without causing any apparent injury to the tobacco leaves.

3995. Mitrofanov, P. I., Čača, A. E., and Solovjeva, N. N.
**The use of BHC on tobacco.** [Russian.]
*Tabak*, 1954, **15** (2): 57-8.

In trials in the Abhaz ASSR during 1952 and 1953 soil applications of BHC were made against soil pests damaging tobacco. The most satisfactory rate of application was 250 kg. per ha., which gave good control and increased yields without affecting the flavour of the tobacco. The treatments stimulated growth, and even in the 1952 dry season, when some reduction in stand occurred, the total yields were almost as good as, and in most cases better than, those in the control plots.

3996. Allen, N., and others.
**Persistence of BHC, DDT, and toxaphene in soil and the tolerances of certain crops to their residues.**
*Tech. Bull. U.S. Dep. Agric.* **1090**, 1954, pp. 19, bibl. 23, illus.

The effects of BHC, DDT and toxaphene were noted on tobacco, cotton and cowpeas grown in a 3-year rotation at Florence, S.C., the tobacco being followed by a winter cover crop of oats and Austrian winter peas and the cotton and cowpeas by rye. The yield of saleable tobacco was reduced by the two heaviest doses of DDT, namely 40 and 100 lb. per acre, but not by a 10 lb. application. All dosages of BHC (from 17 to 83 lb. per acre) appeared to increase the yield of tobacco in 1951 partly owing to reduction in nematode attack, but cigarettes made from it had an undesirable flavour. Toxaphene did not seem to be toxic to tobacco but again the flavour and aroma of cigarettes from treated tobacco was inferior to that from untreated.

## *Composition and curing.*

3997. Bonazzi, A.
Estudios sobre la fisiologia del tabaco. VII.—La topografía de las cenizas solubles. **(Studies on tobacco physiology. VII. Distribution of soluble ash constituents.)**
*Rev. Fac. Ing. agron. Maracay*, 1954, **1**: 219-22, bibl. 5.

The total soluble alkali content of the ash of leaves of Virginia tobacco was investigated. (1) An inverse relation was found to exist between the soluble alkali content of the stem and that of the leaves, while the roots had the lowest content. (2) There was a concentration gradient of soluble alkali in the leaves which increased with age; it was greatest in the leaves in the basal third of the stem and fell later as these ceased to function actively. This suggested that there is translocation of bases from the mature to the young leaves. The concentration gradient of bases is in the opposite direction to that of nitrogen [see *H.A.*, 23: 4338]. The upward flow of total bases appeared to be much slower than that of N, showing that the former are not needed in such high concentration in the meristematic tissues as in the more mature leaves. (3) A positive correlation appeared to exist between the concentration of total bases and leaf function, a hypothesis which finds confirmation in the high concentration of bases in the upper stem through which they must pass on their way to the upper leaves.

3998. Chippendale, F.
**Partial chemical composition of Queensland flue cured tobacco.**
*J. Aust. Inst. agric. Sci.*, 1954, **20**: 58-60, bibl. 10.

Leaf abnormalities encountered in Queensland tobacco are described. Analysis of such leaves and of leaves from normal plants show that most of the affected plants contain excessive Cl and low B and/or Cu values and in some cases low Mo and Zn. Field trials with applications of K, B, Cu, Mo, and Zn have been started.

3999. Stephen, R. C., Neas, I., and Hunter, J. G.
**Towards a better cure.**
*Rhod. Tobacco*, 1954, No. 5, pp. 3-5, illus.

Experiments at Trelawney and Kutsaga Research Stations show that the development of barn spot is reduced to a minimum if initial yellowing is done between 100° and 102° F. at 100% humidity. At yellowing temperatures of 90° and 94° F. barn spot accounted for 67–68% of the final amount of spot, whereas at 102° F. it contributed only 18%. At 85% humidity barn spot approached 60% but at 100% it was just over 40%. It ranged from 50% to just over 60% when the yellowing temperature was raised from 85° to 95° F. or from 90° to 100° F. by stages, but was just over 30% when the temperature was 100° F. from the start. Notes are given on control of heating and humidity, ventilation, insulation and leaf hanging.

4000. Donadoni, S., and Tombesi, L.
Sull'effetto esercitato dalle varie temperature durante l'ultima fase della cura del tabacco var. Virginia bright. **(The effect of different temperatures during the final stage of curing Virginia bright.)**
*Tabacco*, 1954, **58**: 211-19, bibl. 3.

In some quarters a minimum temperature of 85° C. is considered to be necessary in the final stage of curing Virginia bright. Tests at the Fattoria Autonoma Tabacchi at Città di Castello showed, however, that in curing at temperatures which did not exceed 55°, 65°

and 70° C., reducing sugars increased in relation to non-reducing sugars while total sugars remained more or less constant. A maximum of 70° C. appeared to give the best flavour to Virginia bright of Umbrian origin.

4001. VERDURA, R.
Le trasformazioni chimiche del Virginia bright durante la cura: raffronto tra cura normale e cura in "Garbuio". **(The chemical changes in Virginia bright during curing: a comparison of normal with Garbuio curing.)**
*Tabacco*, 1954, **58**: 227-39, bibl. 13.

A comparison was made of the chemical changes taking place in Virginia bright during flue-curing by the normal method and in a Garbuio kiln in which accurate air conditioning is possible. Total N remained virtually constant in both cures. Starch decomposition and losses in protein and dry matter were less in the Garbuio cure. There were gains in reducing and non-reducing sugars in the Garbuio cure and losses in the normal cure. The Garbuio cure took a much shorter time and gave a higher yield of cured leaf. The Garbuio kiln is described.—Ist. sci. sper. Tab., Scafati, Salerno.

4002. MARTINO, C.
Sulla perdita di sostanza secca nei tabacchi orientali durante la cura. **(Loss in dry matter in Turkish tobaccos during curing.)** [English summary ½ p.]
*Tabacco*, 1954, **58**: 111-26, bibl. 6.

In tests at Lecce the yield in dry matter was greatest in the variety Xanthy Yaka, intermediate in Erzegovina and least in Perustitza, and the loss in dry matter during curing was greatest in Perustitza, intermediate in Xanthy Yaka and least in Erzegovina.

***Noted.***

4003.

a BOLSUNOV, I.
Die Möglichkeiten der Fixierung der Heterosis bei selbstbefruchtenden Pflanzen und ihre Bedeutung für die praktische Tabakzüchtung. **(Fixing heterosis in tobacco and its bearing on breeding.)** [English summary ½ p.]
Reprinted from *Fachl. Mitt. österreich. Tabakregie*, 1954, Hft 1, pp. 19-28, bibl. 19, illus.

b KAPADIA, V. H., AND AGGARWAL, J. S.
**Indian tobacco seed oil for varnishes and paints.**
*J. sci. industr. Res., India*, 1954, **13B**: 352-4, bibl. 16.

c SCARASCIA, G. T.
Effetti citologici di estratti acquosi di semi di *N. tabacum*. **(The cytological effects of aqueous extracts of tobacco seed.)** [English summary ½ p.]
*Tabacco*, 1954, **58**: 220-6, bibl. 7.
On the apical meristem of onion roots.

d SCHNEIDER, I. R.
**The effect of purines, purine analogs and related compounds on the multiplication of tobacco mosaic virus.**
*Phytopathology*, 1954, **44**: 243-7, bibl. 10.

e VITTORIO, P. V., KROTKOV, G., AND REED, G. B.
**Synthesis of radioactive sucrose by tobacco leaves from $C^{14}$ uniformly labelled glucose and glucose-l-phosphate.**
*Canad. J. Bot.*, 1954, **32**: 369-77, bibl. 12, illus.

## MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

### *Culinary and spice plants.*

(*See also* 3955f, 4068z.)

4004. GROSZMANN, H. M.
**Ginger production.**
*Qd agric. J.*, 1954, **78**: 259-62, illus.

Ginger (*Zingiber officinale*) became a commercial crop in Queensland during the last war, when Oriental supplies were cut off. A description is given of soil requirements, cultivation, planting, fertilizing, mulching, harvesting and saving rhizomes for replanting.

4005. TONNIER, J.-P.
Le vanillier. Études effectuées en 1953. **(Vanilla studies made in 1953.)**
*C.R. Rech. agron. Madagascar 1953*, No. 2, pp. 104-7, illus.

Seeds of *Vanilla madagascariensis* were successfully germinated in 3 months on Bouriquet's nutrient medium to which coconut milk had been added. The biology of *Rhizoctonia repens*, a symbiotic fungus of *Vanilla*, was studied: on an artificial nutrient medium there was neither better nor quicker germination of *V. planifolia* in the presence of *R. repens*. After germination, however, the plantlets which had the fungus showed increased growth and development. A method of germinating seed of *V. planifolia* is described; mature seeds were cleaned in a solution containing potassium hypochlorite for 48 hours, sown in petri dishes on filter paper, river gravel or asbestos, and subjected to a temperature of 32° C. On river gravel, which gave the best results, germination started 6 days after sowing, and on the 28th day the germination percentage was 72% to 79%. The germinating seeds were then transferred to a nutrient medium of sterilized sawdust of *Albizzia lebbek* and *Coffea canephora*, previously inoculated with *Rhizoctonia repens*. Subsequently, at monthly intervals, the plantlets were transferred to similar sawdust media containing progressively more humus. Good results were also obtained with *Vanilla tahitensis*, *V. tiarei*, *V. haapape* and *V. potiti*.

### *Drug plants.*

(*See also* 4026, 4068f, i, j, t, v-y.)

4006. ALTMAN, R. F. A.
**Steroidal sapogenins in Amazonian plants.**
*Nature*, 1954, **173**: 1098, bibl. 2.

Tabulated data are presented on the sapogenin content of 21 Brazilian plants showing the part of the plant in which the chemical occurs. No plant contained less than 0·2% sapogenins. Much the highest content, 2·31%, occurred in bast of *Pithecolobium cauliflorum*. Other plants examined included 6 species of *Derris*.—Inst. agron. Norte, Belém, Brazil.

4007. Gleisberg, W.
Herbizide und wachstumsfördernde Wirkung einer "Larvacide"-Bodenbehandlung. (Versuche mit Heilpflanzenkulturen.) **(The herbicidal and growth promoting action of a soil treatment with Larvacide. Experiments with medicinal plants.)**
*Gartenbauwiss.*, 1954, **1**[*]: 91-120, bibl. 3, illus.

The growth promoting and herbicidal action of Larvacide, a soil fumigant containing chloropicrin, was shown to be of a high order similar to that of steam sterilization in tests on more than 30 medicinal plants. The plants benefited most from the chemical when they were planted, not sown, in treated soil. Grasses proved more resistant to Larvacide than the dicotyledonous weeds encountered; low dosages of the fumigant stimulated the germination of weed seed. Dosages and methods applied and responses to the treatment of medicinal plants and weeds are discussed in detail.

4008. Kljajić, R.
**A contribution to the study of parasitic flora on medicinal herbs in 1952.** [Serbian, with English summary $1\frac{1}{2}$ pp.]
*Rev. Res. Work Fac. Agric. Belgrade*,[†] 1953, **1** (2): 185-200, bibl. 18, illus.

Some 39 medicinal plants, growing both in the wild state and in cultivation, and diseases attacking them in Serbia are listed. Of the diseases the most important were: *Septoria digitalis* on *Digitalis* spp.; Atropa mosaic on *Atropa belladonna*; *Alternaria* spp. on *Datura stramonium*, *Gentiana lutea* and *Saponaria officinalis*; *Sclerotinia libertiana* on *Gentiana lutea*; and *Fusarium herbarum* on *Saponaria officinalis*.

4009. Perelló Barceló, J. M., Abad Manrique, J. B., and Luna Moreno, C.
Phénomènes de carence dans les racines de belladonne in vitro. **(Symptoms of deficiency in belladonna roots *in vitro*.)**
*Bull. Soc. Chim. Biol.*, 1952, **34** (11): 1106-11, illus., from abstr. in *Biol. Abstr., Sect. D*, 1954, **28**: No. 6861.

*Atropa belladonna* roots cultivated *in vitro* required Cu, B, Mn, Zn and Mo for growth and alkaloid synthesis.

4010. Reitsema, J., Satina, S., and Blakeslee, A. F.
**The effect of indole-3-acetic acid on datura embryos.**
*Proc. nat. Acad. Sci. Wash.*, 1953, **39**: 924-33, bibl. 19.

The growth of *Datura stramonium* embryos *in vitro* was found to be inhibited by indole-3-acetic acid in concentrations of $10^{-2}$ p.p.m. or higher.

4011. Paris, D., and others.
**Effect of amino acids, especially aspartic and glutamic acid and their amides, on the growth of *Datura stramonium* embryos *in vitro*.**
*Proc. nat. Acad. Sci. Wash.*, 1953, **39**: 1205-12, bibl. 16.

The stimulatory effect of casein hydrolysate on the growth of *Datura stramonium* embryos decreases when the stage of development of the embryos advances. Glutamine has a limited effect on growth. Glutamic acid, aspartic acid and asparagine have no effect or are inhibitory; they cause formation of anthocyanins and brown spots. Nitrate ions decrease the effect of casein hydrolysate or glutamine on very young stages. [From authors' summary.]

4012. Chandra, V.
**Vegetative propagation of *Rauwolfia serpentina* Benth.**
*J. sci. industr. Res., India*, 1954, **13A**: 187.

A quick method of vegetative propagation for *Rauwolfia serpentina* is briefly described using root cuttings of 0·3 to 0·7 in. in diameter. Root cuttings 0·5 in. in diameter, treated with hormone and planted in sand, rooted within 10 to 15 days.

4013. Dijkman, M. J., and Azoff, M. B.
**Notes on fruiting of *Strophanthus sarmentosus* in south Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 200-5, bibl. 17, illus.

The flowers of *Strophanthus sarmentosus* showed varying degrees of self-compatibility ranging from incompatibility to relative compatibility; there is thus a possibility of finding self-fertile individuals. Intraspecific cross-pollination was possible. Hand pollination increased the fruiting response but not to a commercial extent. On mature vines only 1 flowering period was observed, and fruit developed only on strong leader shoots. The fruit required 1 year to ripen. There were indications of a possible correlation between fruiting and nutrition with major and minor elements combined with heavy mulching.

4014. Fanshawe, D. B.
**The genus *Strychnos* in British Guiana.**
*Brittonia*, 1954, **8**: 65-8, bibl. 7.

Brief notes, compiled from various sources, are given on 14 species of *Strychnos* found in British Guiana, where they are known collectively as devildoers. *S. toxifera* is most highly prized by Amerindians as a source of blowpipe and arrow poisons, but 6 or 7 other species also contain alkaloids of the curare type.—Forest Dep., B.G.

### *Essential oils.*

(*See also* 4068b, q, 4248, 4446v.)

4015. Handa, K. L., Kapoor, L. D., and Channa, O. N.
**A preliminary note on the essential oil bearing plants of Kashmir.**
*Indian J. agric. Sci.*, 1953, **23**: 147-51, bibl. 9.

Ten essential oil bearing plants, indigenous and introduced, were examined; the yield and some physical properties of oils from them were studied and compared with those from other countries.

---

[*] New series. Vol. 18 was published in 1945.
[†] Formerly *Yearb. Fac. Agric. Belgrade*.

4016. Ivanoff, D., Ivanoff, C., and Ognianoff, I.
Sur un appareil de dosage de petites quantités d'huiles essentielles dans des matériaux végétaux et plus spécialement dans les fleurs de roses. **(An apparatus for measuring small quantities of essential oils in plant materials and especially in rose flowers.)** [Russian summary 5 lines.]
*C.R. Acad. bulg. Sci.*, 1953 (issued 1954), **6** (1): 9-12, bibl. 2, illus.

Describes a satisfactory volumetric method of estimating the essential oil content in plant tissues using 250 g. of material.

4017. Ivanoff, D., Ivanoff, C., and Ognianoff, I.
Essai pour fixer la fin de la distillation dans la production de l'huile de roses. **(An experiment for determining the end of distillation in the production of rose oil.)** [Russian summary 6 lines.]
*C.R. Acad. bulg. Sci.*, 1953 (issued 1954), **6** (1): 13-16, bibl. 4, illus.

Rosenthaler's colorimetric reaction gave a positive indication of rose oil in concentrations above 0·002% and was found satisfactory for determining the end point of distillation.

4018. Ivanoff, D., Ivanoff, T., and Stoïanova-Ivanova, B.
Sur la composition du stéaroptène de l'huile de roses bulgare. **(The composition of the stearoptene of Bulgarian rose oil.** [Russian summary 7 lines.]
*C.R. Acad. bulg. Sci.*, 1953 (issued 1954), **6** (1): 29-32, bibl. 9.

The stearoptene of Bulgarian rose oil is composed of saturated hydrocarbons, of which normal eicosane is the major constituent.

4019. Ivanoff, D., Ognianoff, I., and Nicoloff, N.
Sur l'huile de zdravetz bulgare. **(On Bulgarian *Geranium macrorrhizum* oil.)** [Russian summary 4 lines.]
*C.R. Acad. bulg. Sci.*, 1952 (issued 1953), **5** (2/3): 33-6, bibl. 4.

An essential oil obtained from the leaves of *G. macrorrhizum* on a limited commercial scale is described and its constituents are listed.

4020. de Bruyn, J. W., Elzenga, G., and Keuls, M.
**Selection of living angelica roots for volatile oil content.** [Dutch summary ⅓ p.]
*Euphytica*, 1954, **3**: 147-53.

The oil content of dried angelica roots was gravimetrically determined, and found to vary greatly; the differences were thought to be due to genetical characteristics. By using a volumetric method, the distribution of volatile oil and the average oil content of fresh rhizomes and adventitious roots were determined and related. From the resulting table a sufficiently reliable estimate of the oil content of the whole root could be made from a determination on a random sample of 50 g. adventitious roots. By sampling thus the main root survives and can be used for genetical research.

4021. Steiner, M., and Hochhausen, I.
Untersuchungen an Umbelliferenfrüchten über Veränderung des Gehaltes an ätherischen Ölen bei der Reife und Lagerung und seine Beeinflussung durch Aussenfaktoren. **(Changes in the content of essential oils in umbelliferous fruits during ripening and storage, with special reference to the effect of external factors.)**
*Biol. Zbl.*, 1954, **73**: 283-96, bibl. 21, illus.

(1) A modified Cocking-Middleton method for the estimation of essential oils is described. (2) The oil content (based on dry weight) of dill (*Anethum graveolens*) fruits decreased considerably from the green-ripe to the full-ripe stage. (3) An increase in the oil content of several umbelliferous fruits was obtained under anaerobic conditions in a $N_2$ atmosphere. [Translation of authors' summary.]—Univ. Bonn.

4022. Guenther, E.
**The French lavender and lavandin industry.**
*Econ. Bot.*, 1954, **8**: 166-73, illus.

Lavandin, a hybrid resulting from a cross between true lavender (*Lavendula officinalis*) and spike lavender (*Lavendula latifolia*), has recently been planted increasingly in the South of France, where it has largely replaced its parents. Lavandin is cultivated in large plantations at altitudes of 300 to 900 metres and is comparatively easy to grow. Oil yields are higher than those of lavender, the Abrial variety giving 100 to 200 kg. per ha. per year.

4023. Lima, A. R., and Mollan, T. R. M.
Nova variedade de *Mentha arvensis*. **(New variety of *Mentha arvensis*.)** [English summary 14 lines.]
*Bragantia*, 1952, **12**: 277-84, bibl. 3.

M.A.701, a new variety of Japanese mint bred at the Central Experimental Station at Campinas, is high-yielding, drought-resistant and rust-resistant.

4024. Horner, C. E.
**Pathogenicity of *Verticillium* isolates to peppermint.**
*Phytopathology*, 1954, **44**: 239-42, bibl. 6, illus.

Peppermint is a symptomless host and potential reservoir for strains of *Verticillium* capable of causing disease in other crops. Several weeds and crop plants are hosts for strains of *Verticillium* capable of producing wilt in peppermint. [From author's summary.]—Oregon St. Coll., Corvallis.

4025. Luck, J. V.
**Studies on the *Verticillium* wilt of *Mentha piperita* L., with special emphasis on the causal organism, *Verticillium albo-atrum* R. and B.**
*Diss. Abstr.*, 1954, **14**: 916-17, being *Publ.* 8051 of 131 pp.

*Mentha piperita* infected with *Verticillium* wilt can be planted in virgin soils without resulting in a disease incidence equal to that in the field of origin. The reason seems to lie in the following facts: No nutrient is present in the virgin muck soil which can delay or prevent symptom expression. The pathogen is confined to the vascular elements of the host until the death of the host is imminent. An infected plant may only die at the end of the season and then release the fungus into the soil. Finally infected peppermint plants produce disease-free surface runners which give rise to new disease-free plants. These remain disease-free till the inoculum has built up sufficiently in the soil to reinfect.

4026. Ivanoff, D., and others.
Sur l'accélération du repos de l'huile brute de mentheherbe en vue de la stabilisation de l'huile réctifiée. **(Hastening the settling of crude mint oil in order to stabilize the refined oil.)** [Russian summary 7 lines.]
*C.R. Acad. bulg. Sci.*, 1953 (issued 1954), **6** (1): 25-8, bibl. 2.

Aeration of warmed crude oil of *Mentha piperita* hastened settlement and produced a product in no way different from the naturally settled oil.

### *Fibres.*

(*See also* 4068c, d, p, r, 4131.)

4027. Haarer, A. E.
**The behaviour of the chief jute-substitute plants.**
*Proc. Linn. Soc. London*, 1954, **165**: 17-24, bibl. 12.

The potentialities of kenaf (*Hibiscus cannabinus*), roselle (*H. sabdariffa*), and Congo jute (*Urena lobata*) as jute-substitute plants are discussed. Kenaf is strongly responsive to day length and reports indicate that different strains show different responses; some strains also show prolonged seed dormancy. Roselle showed a photoperiodic response in Java, and differences in strain reaction may be genetical. Reports on growing Congo jute in the Belgian Congo show that there are early and late maturing strains, apparently growing independently of day length. The author concludes that further study of strain responses to day length and of seed dormancy in the *Hibiscus* spp. is desirable.

4028. Ragazzi, G.
Nemici vegetali ed animali della canapa. **(Plant and animal pests of hemp.)**
*Humus*, 1954, **10** (5): 27-9, illus.

In Italy few of the diseases and pests of hemp [*Cannabis sativa*] are serious. Brief notes are given on its fungal and other diseases and on its insect and nematode pests.

4029. Sebastine, K. M.
**Kaivun fibre.**
*Econ. Bot.*, 1954, **8**: 114-17, bibl. 3, illus.

Kaivun (*Helicteres isora*) is a useful fibre-yielding, perennial shrub, which grows as an under-shrub in high rainfall regions of India. The plant can be successfully cultivated for yearly cutting and extraction of fibre, which compares favourably with jute.

4030. Toxopeus, H. J.
**Notes on the water household of the kapok-tree *Ceiba pentandra* (L.) Gaertn.**
*Neth. J. agric. Sci.*, 1954, **2**: 186-96, bibl. 6.

Studies were made on the water economy of the kapok tree in S.E. Asia; the water content of the trunk, branches, twigs, flowers and fruits was determined at regular intervals and the transpiration rate of leaves and fruits was studied. The limiting factor for fruit set appeared to be the length of time at the beginning of the dry season, during which the tree was in full leaf; at this time there was strong competition for available water between transpiring leaves and growing fruitlets. The total water consumption of a kapok tree and its transpiration ratio was roughly estimated, and compared with data on some annual and perennial plants. The author concludes that the kapok tree uses the available water economically.

4031. Torres, J. P., Lanuza, E. A., and Cruz, P. I.
**Studies on abaca pollination and seed germination.**
*Philipp. J. Agric.*, 1952 (issued 1954), **17**: 183-201, bibl. 5, illus.

An account is given of investigations on pollination and seed germination in the Itom variety of *Musa textilis*. The conclusions were that (1) pollen remains viable up to 2 days; (2) the best time for artificial pollination is 8–10 a.m.; (3) the stigma becomes receptive when the bract has opened to an angle of 60 degrees with the axis and may remain receptive for only 2 days; (4) removal of male inflorescences tends to hasten maturity and increase fruit size; (5) seeds from ripe fruit give the highest germination rate (88–90%); (6) powdered charcoal is a good seed storage medium and keeps seeds viable for 5 months; (7) shade-drying of seed is better than sun-drying; (8) the germination rates of seeds in seedboxes (*a*) exposed to the morning sun or (*b*) heated to 40–50° C. were much higher than those of other treatments; (9) a sowing depth of 2 cm. or less was best for germination and subsequent growth.

4032. Reyes, G. M.
**Notes on the mosaic disease of abaca in Davao; its evil effects on the fiber and seed.**
*Philipp. J. Agric.*, 1952 (issued 1954), **17**: 203-15, bibl. 6.

Investigations on the very susceptible Tangongon variety in 1948 showed that the average tensile strength of fibres from healthy plants was 41 kg. per gm. compared with 34 in diseased plants. Seeds from diseased plants were of abnormal shape or small, less shiny, darker and non-viable.

4033. Castillo, B. S., and Agati, J. A.
**Further studies on the eradication of mosaic diseased abaca with the use of weedicides.**
*Philipp. J. Agric.*, 1952 (issued 1954), **17**: 129-37, bibl. 3, illus.

Dow 2,4-D formula 40 and Geigy 2,4-D ester were the best of 12 herbicides tested for the eradication of mosaic-infected Manila hemp. Both gave a 100% kill after 60 days at concentrations of 0·5 and 0·75%. Manual eradication cost 3–4 times as much as chemical eradication.

4034. Cumber, R. A.
**Injury to *Phormium* caused by insects, mites, and molluscs.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 60-74, bibl. 23, illus.

Various forms of injury to *Phormium* caused by insects, mites and molluscs are described and illustrated and notes given on the biology of the species concerned. The freedom from insect attack and the vigour of *Phormium* which receives periodical, natural flooding is in marked contrast to the condition of plants established in plantations on sandy, high-level areas immediately adjacent to the river. A bibliography of *Phormium* entomology is included.

4035. Cumber, R. A.
**Studies on *Oliarus atkinsoni* Myers (Hemiptera: Cixiidae), vector of the yellow-leaf disease of *Phormium tenax* Forst. IV. Disease-vector relationships.**
*N.Z. J. Sci. Tech., Sect. B*, 1954, **35**: 530-49, bibl. 3, illus.

A series of transmission tests is described, the results of which suggest that the nymphs of *O. atkinsoni* may, like the adults, transmit yellow-leaf disease of *Phormium tenax*. However, the results obtained were not consistent and failed to provide confirmatory evidence that a virus is responsible for yellow-leaf. Assessment was complicated by a large number of plants dying or being affected by a sudden die-back condition. It is not inconceivable that these symptoms and those of yellow-leaf may be due to one pathogen attacking through different channels and that this pathogen may not be a virus.

4036. Cumber, R. A.
**Search for alternative vectors of the yellow-leaf disease of *Phormium*.**
*N.Z. J. Sci. Tech., Sect. A*, 1954, **36**: 32-7, bibl. 4.

Experiments testing 5 possible vector species of the yellow disease of *Phormium* are described. No further vector is incriminated although there is some suspicion in the case of the mealy-bug, *Trionymus diminutus* (Leonardi). [Author's summary.]

4037. Senna Braga, O. T.
Cultivo e industrialización del ramié. **(The cultivation and industrialization of China grass.)**
*Rev. Agric. La Habana*, 1954, **37** (1): 43-62, from abstr. in *Trop. Abstr.*, 1954, **9**: 459.

A survey of the botanical characteristics, soil and climatic requirements, tilling, irrigation, manuring, cultivation, harvesting and processing of ramie (*Boehmeria nivea*) in Cuba. World production of ramie is estimated at 100,000 tons annually, of which China consumes 75 to 90%. Details are given concerning its industrial applications.

4038. Dobelmann, J.-P.
Méthode d'activation des graines de *Raphia*. (*Raphia ruffia*.) **(Germinating raphia seeds.)**
*Bull. Madagascar*, 1954, No. 95, pp. 320-2.

A germination rate of 50% was achieved by paring away the seed coat of decorticated kernels and pregerminating the prepared seeds in trays in the sun between layers of mixed sand and charcoal. Germination generally took place within 4–5 weeks.—Stat. agric. Marovoay.

## *Hops.*

(*See also* 3674, 4068a, l, 4473, 4482.)

4039. Wye.
***Report of the Department of Hop Research, Wye College, Kent, for 1953,*** 1954, pp. 72, 4s.

Sward culture: the most promising seeds mixture is S50 timothy and S100 clover. Organic constituents: preliminary chromatographic studies, especially of resin biosynthesis. Current research into hop drying. [See also separate abstracts below.]

4040. Neve, R. A., Farrar, R. F., and Salmon, E. S.
**Plant breeding section: Review of the year's work.**
*A.R. Wye Coll. Dep. Hop Res. 1953*, 1954, pp. 41-5.

Notes are given on (1) the Wye/East Malling Research Station joint project for breeding *Verticillium* wilt resistant hops, (2) the production of polyploid hops of Brewer's Gold, Bullion and Eastwell Golding, (3) research on the relationship between the number of resin glands on the anthers of male hops and the amount of resin in the cones of related female hops, (4) new varieties, including OZ97a which has shown resistance (tolerance) in a *Verticillium* resistance trial at East Malling, and (5) commercial production and acreage of new varieties.

4041. Beard, F. A., and Jary, C. L.
**The new varieties of hops.**
*A.R. Wye Coll. Dep. Hop Res. 1953*, 1954, pp. 29-40.

*Substitutes for American hops.* Brewer's Gold (C9a) and Bullion (Q43). *Wilt tolerant varieties.* Keyworth's Midseason (OR55) and Keyworth's Early (OJ47) are being replaced by Bramling Cross (OT48) and "1147". *Higher valuation hops to replace Fuggle.* Northern Brewer (WFB135), John Ford (WFA90), Norton Court Golding (WFG19), Pride of Kent (170a), Sunshine (V94) which is immune to mould [*Sphaerotheca humuli*] and resistant to downy mildew, Early Choice (FF21) and Copper Hop (OK40). *Hops for machine picking.* Fuggle is not good for machine picking but most of the new varieties are and they already provide the desirable succession of ripening periods. Attempts are being made to produce triploid hops which, being virtually seedless, will be even less liable to shatter. *Resistance to diseases other than wilt.* All the new varieties mentioned above are susceptible to downy mildew [*Pseudoperonospora humuli*]. *Characteristics of the individual new varieties* are briefly described.

4042. Beard, F. H., and Thompson, F. C.
**Height of wirework and spacing trial. Progress Report 1.**
*A.R. Wye Coll. Dep. Hop Res. 1953*, 1954, pp. 23-8, bibl. 1.

Experiments were made with Fuggle "N", John Ford, Bullion and Brewer's Gold in 1952 and 1953 to ascertain the combination of height and spacing which will produce the type of growth most suitable for machine picking and at the same time give good yields. The heights used were 17¼, 15 and 13 ft. and the spacings were 6×6½, 7½×6½ and 9×6½ ft. It was found that increasing the height of the wirework produced the type of growth required for machine picking, i.e. with the hops well distributed along the bine and an absence of large, tangled heads, without having the marked effect on crop yield caused by varying the width of spacing. The best height and spacing for crop production, for machine picking and for highest acre yield are given for the 4 varieties. Those for machine picking for Fuggle, John Ford, Bullion and Brewer's Gold were 17¼ and 7½×6½ ft., 17¼ and 7½×6½ or 9×6½ ft., 17¼ and 9×6½ ft., and 17¼ and 9×6½ ft. respectively.

4043. Thompson, F. C.
**General report. Hop nutrition and manuring.**
*A.R. Wye Coll. Dep. Hop Res. 1953*, 1954, pp. 7-8.

The conclusions drawn from experiments and field observations over the last 3–4 years are: (1) N applications should be about 300 lb./acre; (2) heavy P applications are unnecessary where available soil P is high; (3) K is the most commonly deficient mineral and a very high level of available K should be built up and maintained; (4) Mg deficiency symptoms are common, especially towards the end of the growing season, but an appreciable reduction in yield occurs only in severe cases involving early and extensive defoliation; (5) hops can grow at a lower soil pH than was once thought and the range now recommended is 5·5–6·0; when Ca content is very high K uptake is suppressed and growing hops at the lower pH now recommended should tend to increase K uptake; (6) trace elements do not appear to be important in hop nutrition; (7) manurial treatment has no influence on resin production.

4044. Talboys, P. W., and Wilson, J. F.
**A method for determining the pathogenicity of strains of *Verticillium albo-atrum* isolated from the hop.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 158-61, bibl. 7, illus.

When outbreaks of wilt occur in hop gardens it is desirable to determine as quickly as possible whether the disease is the mild form known as fluctuating wilt or the severe and usually lethal form known as progressive wilt. The differences between the two forms of attack may be attributed to the existence of at least two strains of *Verticillium*. A method is described of growing hop plants in concrete tanks to provide material for artificial infection with *Verticillium*. A trial with 6 different isolates of the fungus showed marked differences in symptom expression which were directly related to the form of the disease existing in the fields from which the pathogen was isolated.

4045. Emery, G. A.
**Trials with systemic insecticides on hops.**
*World Crops*, 1954, **6**: 289-92.

Trials were carried out in hop gardens in Worcester, Hereford and Kent to control the hop damson aphis (*Phorodon humuli*) and red spider (*Tetranychus telarius*) on 5 hop varieties, viz. Fuggle, Cobb, Bullion, Mathon and OR55. The insecticides used were schradan, systox, "tris" (trisdimethylaminophosphine oxide) and Terra-Sytam, a commercial preparation based on bisdimethylamino fluorophosphine oxide. Results showed that schradan at the rate of 0·075% gave effective control of aphis and adequate control of red spider, when applied twice, in early June at 100 gal. per acre and 6 to 7 weeks later at 200 gal. per acre. Systox did not adequately control aphis or red spider with less than 3 applications at a rate of 0·05%. "Tris" gave the least effective control of the materials used, but is non-poisonous. Terra-Sytam at 2·5% watered onto the crown at 100 ml. per hill at the beginning of June gave complete control of aphis and red spider until picking; there was no residual effect in beer subsequently brewed from these hops.

4046. Collingwood, C. A.
**The hop root weevil.**
*Plant Path.*, 1954, **3**: 63-5, bibl. 5, illus.

Promising results for the control of *Epipolaeus caliginosus* have been obtained by using 3½% BHC dust applied in early June at a rate of 1 lb. per 10 hills (1 cwt. per acre). When plants were dug up and examined 14 months after treatment, 21 larvae were extracted from 16 treated plants, and 123 larvae from 20 untreated plants. All larvae, however, do not pupate in 1 season, so that treatment must be repeated for 2 years. Control of larvae in infested cuttings in the field was fairly successful when the cuttings were soaked in 0·04% parathion. In the laboratory parathion and a fluorophosphine systemic compound, both at 0·1% concentration, gave 60% larval control, but were slightly phytotoxic. Using warm water treatment the cuttings survived temperatures of up to 46° C. for 15 minutes without serious check; larvae were killed at 44° C. and over. Immediate cooling and planting of cuttings after treatment are advised.

4047. Thompson, F. C., Chater, J. P., and Jary, C. L.
**A survey of hop picking machines, 1953.**
*A.R. Wye Coll. Dep. Hop Res. 1953*, 1954, pp. 51-72.

*The 1953 West Midland survey.* Notes are given on (1) modifications made to the Bruff, the most widely used machine; (2) research on the relationship between cone damage and resin losses; (3) a study of the quality of machine-picked hops at all stages up to marketing. The annual West Midland surveys have emphasized the need for "growing the hops for the machine". This can be done by (1) modifying cultural methods such as height of wirework and width of spacing so as to produce the type of growth most suitable for machine picking; (2) extending the season by selection so that the crop coming forward to the machine is at the stage of maturity at which the cones are least liable to damage; (3) developing seedless hops (by polyploidy) which pick better by machine; and (4) by growing those new (Wye) varieties which, owing to their botanical structure, are more suitable for machine picking than the older commercial varieties. *The 1953 Kent survey*, the first of its kind, concerned ripe and over-ripe Fuggles. It was designed (1) to compare machine-picked hops with comparable hand-picked hops at all stages and to measure the amount of wastage; and (2) to assess the effects of the picking and drying processes separately on the breakage of hand-

and machine-picked hops. The results of both 1953 surveys are given in detail.

4048. Verzele, M., and Govaert, F.
**The analysis of hops.** [French and Spanish summaries 9 lines each.]
*Wallerstein Lab. Commun.*, 1954, **17**: 119-25, bibl. 3.

The authors describe an improved procedure for hop analysis which eliminates the use of more than one solvent and appreciably reduces the time required in analytical methods previously worked out by themselves. The new method is based on total extraction of the bitter acids of hops by benzene and on the chromatographic separation of the solution so obtained. An appropriate silica gel is used as adsorbent. Humulon (alpha-acid) is then determined polarimetrically, lupulon (beta-acid) by potentiometric titration. Using this method an analysis requires only about one hour. [From authors' summary.]—Lab. Chim. org. Univ. Ghent, Belgium.

### *Insecticidal plants.*

(*See also* 4068g, u.)

4049. Raghavan Nair, K. N.
**Cultivation of pyrethrum on the Nilgiris.**
*Horticultural and Economic Plants of the Nilgiris*, reprinted in *Plant. Chron.*, 1954, **49**: 180-4, 214-17.

Trials started in 1942 showed that the Nilgiris, at altitudes of 6,000 to 8,000 ft., can provide almost ideal conditions for growing pyrethrum. By 1944, 1,868 acres had been established, though the acreage has since declined. The present article discusses soil and climatic requirements, propagation and nursery techniques, preparation of land, spacing, cultivation, manuring, picking, cleaning, yields and pyrethrin contents, crop rotations and economics. Experience in the Nilgiris is compared with that reported from Kenya. In the former pyrethrin contents are exceptionally high, but average yields of dry flowers per acre are very low, though high yields have been obtained in certain plots. The need for research is evident.

4050. (Potter, C., Healy, M. J., and Feuell, A. J.)
**A comparison of the chemical and biological assays of several strains of pyrethrum flowers.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 59-69.

Here are reported the findings of a collaborative investigation, in which 4 British and 6 American organizations took part, to determine the relative merits of the following 3 strains of Kenya pyrethrum flowers: a medium content strain, Mweiga, and 2 high content strains, C1 (14 × 24) and C47 (188 × 214). The tests indicated that the C47 strain has marked disadvantages as compared with the others; biologically it proved more specific in action and in storage it deteriorated relatively rapidly. However, the investigation as a whole is considered to have been unsatisfactory because clear-cut results were generally lacking and some results were conflicting.

4051. Foucart, G.
Observations sur quelques maladies mycologiques du pyrèthre. (*Chrysanthémum cinerariaefolium* (Trev.) Bocc.). **(Notes on some fungal diseases of pyrethrum, *Chrysanthemum cinerariaefolium*.)** [Dutch summary 1½ pp.]
*Bull. agric. Congo belge*, 1954, **45**: 599-614, illus.

Fourteen fungi so far observed on pyrethrum are listed. Brief notes are given on 5 of these, namely *Fusarium javanicum*, *Pythium* sp., *Rhizoctonia* sp., *Sclerotium rolfsii* and *Sclerotinia sclerotiorum*, and a longer note on bud disease, *Ramularia bellunensis*. After giving the effect of cultural methods on bud disease the author recommends the following control measures: choice of airy, well-drained sites, avoidance of close spacing, careful cleaning after harvesting including removal of flower stalks and diseased basal leaves, regular renewal of plantations by fallowing, removal of pruning trash. Resistant clones are named.

4052. Pagán, C., and Morris, M. P.
**A comparison of the toxicity of mamey seed extract and rotenone.**
*J. econ. Ent.*, 1953, **46**: 1092-3, bibl. 9.

In the tests described derris-root powder was 60 times as toxic to guppy (a minnow) as the powdered seed of mamey, *Mammea americana*, hence it is considered highly unlikely that mamey will ever attain the status of a commercial insecticide.—Fed. Exp. Stat., Puerto Rico.

4053. Beroza, M., and Bottger, G. T.
**The insecticidal value of *Tripterygium wilfordii*.**
*J. econ. Ent.*, 1954, **47**: 188-9, bibl. 11.

Insect pests, including those of horticultural crops, against which *T. wilfordii* root powder proved effective, fairly effective and completely ineffective, are listed.

### *Rubber plants.*

4054. Leeper, H. M., and Schlesinger, W.
**Occurrence of both caoutchouc and gutta in additional plants.**
*Science*, 1954, **120**: 185-6, bibl. 2.

Since chicle (*Achras sapota*) was found to contain both caoutchouc and gutta-percha [*H.A.*, 21: 2111q] several species of *Palaquium* and *Mimusops* from the Philippines and Siam have been found also to contain these 2 hydrocarbons.—Wm. Wrigley Jr. Company, Chicago.

4055. Guseva, A. R.
**The extraction and determination of chlorogenic acid from the leaves of *Eucommia*.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1954, **94**: 1137-9, bibl. 8.

A method for the extraction of chlorogenic acid from leaves of *Eucommia* [*ulmoides?*] is given, and identification by paper chromatography and estimation by electrophotometry are described. Chlorogenic acid was also detected in the bark and surface tissues of the roots of the plant but not in the seeds. It is suggested that the relatively high percentage of this compound in the leaves may be of significance in connexion with the synthesis of gutta therein.

4056. EMPARAN, P. R.
**A guayule air pressure thresher.**
*Agron. J.*, 1954, **46**: 335-6, illus.

Description of a thresher which is said to give complete threshing without causing any mechanical damage. The thresher is a small, compact, light weight machine nearly 24 cm. high by 27 cm. wide. It is made of transparent, acetone-soluble plastic tubing and sheeting with wire cloth inserted between the sections of the tubes. The process is simple and visible throughout.

4057. ŽDANOVA, L. P.
**The synthetic activity of root systems.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1954, **94**: 337-40, bibl. 9, illus.

Root cuttings of rudbeckia (*Rudbeckia bicolor*) and of kok saghyz grew and developed satisfactorily when grafted on kok saghyz rootstocks. End of season analyses have shown that the resin and latex contents of both old and new roots of the grafts were higher than those of ungrafted kok saghyz, though the accumulation of the components, particularly of latex, was greater in roots with kok saghyz than with rudbeckia scions. The roots of the rubber-bearing rootstock, obtaining their assimilates from the rubberless rudbeckia scion, accumulated latex, indicating that in kok saghyz the latex is synthesized in the roots and not, as some workers maintain, in the leaves.

### *Seed oils.*

(*See also* 3639, 4068h, k, m, n, s, 4476.)

4058. ZIMMERMAN, L. H., AND PARKEY, W.
**Pistillate $F_1$ castorbeans: their possible significance in producing commercial hybrid seed.**
*Agron. J.*, 1954, **46**: 287, bibl. 1.

The method for producing single-cross castor bean hybrid seed is dependent on the pistillate character, which is especially pronounced in the female line of the Nebraska 145-4 variety. Pistillate $F_1$ hybrids can be produced, without roguing the normal monoecious plants, by crossing Brazilian 330 or USDA 49 with female Nebraska 145-4 plants; an $F_1$ population entirely pistillate was produced by the Brazilian 330 cross, and one containing only a trace of male plants was produced by the USDA 49 cross.

4059. PARKEY, W., AND SCHOENLEBER, L. G.
**A new device, mechanical nomograph, for measuring the sex expression in castor beans, *Ricinus communis*.**
*Agron. J.*, 1954, **46**: 288-9, bibl. 1, illus.

An instrument is described, which measures the percentages of staminate and pistillate flowers on the castor bean inflorescence.

4060. BHARUCHA, F. R., AND JOSHI, G. V.
**A note on organic acids of *Ricinus communis* Linn.**
*Sci. and Cult.*, 1954, **19**: 565-6, bibl. 6, illus.

Paper chromatographic studies showed that 7 organic acids are present in castor bean plants. The most important is malic acid. The others are citric, oxalic, glycolic, tartaric, ascorbic and succinic acids.

4061. SCHOENLEBER, L. G., AND TAYLOR, W. E.
**Development of a portable castor bean huller.**
*Agric. Engng St. Joseph, Mich.*, 1954, **35**: 327-32, 336, bibl. 1, illus.

Improvements made on an experimental castor bean huller described earlier [see *H.A.*, 23: 2061] include the addition of an integral feed elevator, single engine, variable fan speed, more accurate adjustment of hulling discs and more precise construction with adjustments to permit a greater range for tests and conditions experienced in research investigations.

4062. GRINDLEY, D. N., BURDEN, E. H. W. J., AND AKOUR, A. A.
**The seed oils of *Clitoria ternatea* and of *Entada phaseoloides*.**
*J. Sci. Food Agric.*, 1954, **5**: 278-80, bibl. 13.

The seed oils of the species *Clitoria ternatea* and *Entada phaseoloides* have been examined in detail and their fatty acid composition determined. Like other species belonging to the Leguminosae group of families previously examined, they are characterized by the presence of higher saturated fatty acids. [Authors' summary.]—Wellcome Chem. Lab., Minist. of Health, Khartoum.

4063. GRAY, S. G.
**Experiments with safflower in southern Queensland.**
*Tech. Pap. Div. Plant Ind., C.S.I.R.O., Aust.* **2,** 1954, pp. 14, bibl. 8.

Experiments with safflower have been in progress in southern Queensland since 1946, mainly at the Queensland Agricultural College, Lawes. Thirty-one strains have been tested and selections for non-spininess and suitability for mechanical harvesting have been made. Seed yields obtained at Lawes compare favourably with those obtained in the United States of America and in the temperate regions of Australia. The crop is more drought-resistant than linseed and should be successful in the drier parts of the Queensland wheat belt, which would be marginal for linseed-growing. The main hazard with safflower in southern Queensland is the possibility of the ripening crop being damaged by storms in early summer. The use of early-maturing varieties to overcome this difficulty is suggested, and several varieties are recommended for more extensive trial. [Author's summary.]

4064. C.S.I.R.O., AUSTRALIA.
**Oil crop investigations.**
*A.R. C.S.I.R.O., Aust., 1952/53*, 1953, p. 22.

The main investigation is on the culture of safflower (*Carthamus tinctorius*), and extensive selection and yield trials are in progress. Economically safflower growing is found to give higher returns per acre than linseed.

### *Tannin plants.*

(*See also* 4068o.)

4065. ISTAS, J. R., AND HONTOY, J.
Looistofgehalte van hout en schors van kongolese houtsoorten. (**Tannin contents of the timber and bark of some Congo trees.**) [French summary 15 lines.]
*Bull. agric. Congo belge*, 1954, **45**: 373-6.

Only 5 of the 13 timbers tested had important tannin contents (6·83–8·74%); these were *Staudtia gabonensis*, *Piptadenia glandulifera*, *Strombosia grandiflora*, *Entandrophragma angolense* and *E. utile*. Some of the barks tested were rich in tannin, for example *Piptadenia glandulifera* 38·4%, *Hylodendron gabonense* 21·62, *Staudtia gabonensis* 19·38 and *Oxystigma oxyphyllum* 16·69.

### *Sundry plants.*

(*See also* 4454.)

4066. Lawson, G. W.
**Agar from *Gracilaria henriquesiana*.**
*Amer. J. Bot.*, 1954, **41**: 212-14, bibl. 5.

*Gracilaria henriquesiana* is one of the commonest red algae present among the inter-tidal seaweeds of the Gold Coast. An agar-like gel was extracted from this seaweed having a melting point at 86° to 87° C., gelation point at 46° to 47° C., viscosity 1·9 at 50° C. and 63 g. per square cm. gel strength at 30° to 35° C. Extraction under optimal conditions gave 10 to 20 g. from 100 g. dry weed.—Univ. Coll. Gold Coast, Achimota.

4067. Coveney, R. D., and Islip, H. T.
**Gum arabic and soil from Somaliland Protectorate.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 42-5.

The commercial use of gum arabic collected from *Acacia senegal* in Somaliland Protectorate is limited by its abnormally high viscosity. Analysis of soils from the area has confirmed that they are highly calcareous, but analysis of 30 samples of gum arabic has revealed no linear relationship between their viscosity and (*a*) the ash content of the gum, (*b*) its calcium content, or (*c*) the content of the remaining mineral constituents.

### *Noted.*

4068.

a Alderton, G., and others.
**Spectrophotometric determination of humulone complex and lupulone in hops.**
*Analyt. Chem.*, 1954, **26**: 983-92, bibl. 12.

b Anon.
**Exports of essential oils from the British Colonies for the years 1949-52.**
**Domestic exports of essential oils from the Dominions for the years 1949-52.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 24-7, 28.
Weights and values tabulated by countries.

c Asai, T., and Saito, H.
**Microbial degumming of fibers. Part 9. Adaptive formation of pectic enzymes by *Aspergillus niger*. (I.)**
*J. agric. Chem. Soc. Japan*, 1952, **26**: 381, English abstr. in *Rec. Res., Fac. Agric. Univ. Tokyo 1952-1953*, 1954, No. III, pp. 31-2.

d Asai, T., Saito, H., and Yamaoka, A.
**Microbial degumming of fibers. Part 10. Adaptive formation of pectic enzymes by *Aspergillus niger*. (II.)**
*J. agric. Chem. Soc. Japan*, 1952, **26**: 389, English abstr. in *Rec. Res. Fac. Agric. Univ. Tokyo 1952-1953*, 1954, No. III, p. 32.

e Bergmann, W.
**The plant sterols.**
*Annu. Rev. Plant Physiol.*, 1953, **4**: 383-426, bibl. 493.

f Chakrabarti, J. K., and Sen, N. K.
**Bitter constituents of the seeds of *Corchorus olitorius* L., "corchorgenin"—a new cardiac-active aglycone.**
*J. Amer. chem. Soc.*, 1954, **76**: 2390-2, bibl. 12.

g Cornelius, J. A.
**A chromotographic procedure for the determination of "pyrethrins" in pyrethrum extracts.**
*Analyst*, 1954, **79**: 458-60, bibl. 9.
A quantitative method of separating pyrethrins I and II.

h Deutschmann, F.
Zur Mikroscopie von Tengkawang und deren Unterscheidung von echter Illipe. **(The morphology of tenkawang [*Shorea* sp.] and its differentiation from *Illipe* sp.)**
*Angew. Bot.*, 1954, **28**: 1-12, bibl. 7, illus.
Tropical oil-bearing nuts.

i Fulling, E. H.
**American witch hazel.**
*Gdn J. N.Y. bot. Gdn*, 1954, **4**: 97-101.
For a fuller account see *H.A.*, 24: 1716.

j Gedeon, J.
**Saponins from Indian soapnuts.**
*J. sci. industr. Res., India*, 1954, **13B**: 427-8, bibl. 7.
*Sapindus mukorossi* and *S. laurifolius*.

k Gómez, S. A.
Caparidáceas argentinas. **(The Capparidaceae of Argentina.)**
*Lilloa*, 1953, **26**: 279-341, bibl. 40, illus.

l Harris, R. V.
**Wilt-tolerant hops.**
*A.R. E. Malling Res. Stat. 1953*, 1954, **A37**: 208-9.
The prospects of 5 new varieties tolerant to *Verticillium* wilt discussed. [See *H.A.*, 24: 609.]

m Kohoutová, Z.
Šlechtění máku s ohledem na olejnatost. **(Poppy breeding with regard to oil content )** [English and Russian summaries 1 p. each.]
*Preslia*, 1953, **25**: 97-106, bibl. 32.

n Ligthelm, S. P., and others.
**A chemical study of the fruits of three South African *Ximenia* species, with special reference to the kernel oils.**
*J. Sci. Food Agric.*, 1954, **5**: 281-8, bibl. 23.
*Ximenia caffra*, *X. caffra* var. *natalensis*, and *X. americana*.

o Mathew, E. C., and Das, B. M.
**Studies on Indian vegetable tanning materials: Part I.**
*J. sci. industr. Res., India*, 1954, **13B**: 387-8, bibl. 25.
Avaram (*Cassia auriculata*).

p Ocfemia, G. O.
**Note on the occurrence of the mosaic disease in the Abacá Experiment Station in Banao, Guinobatan, Albay.**
*Philipp. Agric.*, 1953, **37**: 84-7, illus.

q O'Neill, L. A., Dennison, A. C., and Ahlers, N. H. E.
**The constitution of kamala oil.**
*Chem. Ind. Lond.*, 1954, No. 26, pp. 756-7, bibl. 1.
From *Mallotus philippensis*.

r Rataj, K.
Předběžná symptomatika viros na nově zaváděných přadných rostlinách. (**A preliminary description of symptoms of virus diseases on newly introduced fibre plants.**) [English and Russian summaries $\frac{1}{4}$ p. each.]
*Preslia*, 1953, **25**: 107-10, bibl. 5.
Namely *Asclepias syriaca*, *Napaea dioica* and *Althaea officinalis*.

s Riedl, W. A., and others.
**Safflower variety adaptation trials in Wyoming 1951 and 1952.**
*Mimeo. Circs Wyo. agric. Exp. Stat.* **17** and **31**, 1952 and 1953, pp. 5 each, bibl. 4.

t Sharma, V. N., Kohli, J. D., and Mukerji, B.
**Chemistry and pharmacology of *Rauwolfia*.**
*J. sci. industr. Res., India*, 1954, **13A**: 261-72, bibl. 54.

u Snyder, H. R., and others.
**The insecticidal principles of *Haplophyton cimicidum*. I. Haplophytine.**
*J. Amer. chem. Soc.*, 1954, **76**: 2819-25, bibl. 22.

v Starý, F.
Farmakobotanická monografie *Adonis vernalis* L. (**A pharmaco-botanical monograph on *Adonis vernalis*.**) [Russian and German summaries 2 pp. each.]
*Preslia*, 1952, **24**: 3-39, bibl. 5 pp., illus.
Containing the cardiac glucoside, adonidin.

w White, E. P.
**Alkaloids of the Leguminosae. Part XXIII. The occurrence of N-methyl-β-phenylethylamine in *Acacia prominens* A. Cunn.**
*N.Z. J. Sci. Tech., Sect. B*, 1954, **35**: 451-5, bibl. 6.

x Wilder, E. A., and Kitzke, E. D.
**Waxy constituents of the saw palmetto, *Serenoa repens* (Bartr.) Small.**
*Science*, 1954, **120**: 108-9, bibl. 3, illus.
The properties of a hard wax from the leaves.

y Youngken, H. W., Sr.
**A note on *Rauwolfia serpentina*.**
*Amer. J. Pharm.*, 1953, **125** (6): 186-9, from abstr. in *Biol. Abstr., Sect. D*, 1954, **28**, No. 11931.
Distinguishing characters.

z Yuncker, T. G.
**The Piperaceae of Trinidad and Tobago.**
*Lilloa*, 1953, **26**: 239-78, bibls.
Includes *Piper nigrum* and *P. betle*.

## FLORICULTURE.

### *General.*

(*See also* 3324, 3325, 3431, 3575, 3588, 3841, 3944, 4162 l, r, v, w, 4163d, f, i, 4456, 4463, 4472, 4474, 4491.)

4069. Puccini, G.
Ricerche sull'impiego della vermiculite nella floricoltura. (**Research on the use of vermiculite in floriculture.**) [English summary 15 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 717-34, bibl. 11.

Vermiculite was compared with sand, soil, leaf mould and sphagnum as a germinating medium and as a rooting medium for herbaceous, semi-woody and woody ornamentals. It had a better water-absorbing and water-holding capacity than any of the other materials except sphagnum but in general was not a good medium. It is considered, however, that fine vermiculite might be suitable for the germination of the seeds of succulent plants and of slow-germinating seeds that require high, constant moisture for a long period. The results of the tests are tabulated.—Staz. sper. Floric., Sanremo.

4070. Mullard, S. R.
**Rooting cuttings in vermiculite (acid grades).**
*J. roy. hort. Soc.*, 1954, **79**: 367-8.

Trials suggest that losses of cuttings due to stem rot can be minimized by allowing only the tips of the cuttings to be in contact with vermiculite kept saturated by sub-irrigation. Camellia cuttings treated in this way with their stems supported by a layer of dry silver sand showed 100% rooting, and a rose variety 80%. Cuttings of carnations, chrysanthemums and fuchsias, supported by wire mesh instead of by sand, rooted in 3 to 4 weeks when set with their tips merely resting on the surface of the vermiculite; geraniums were less successful.

4071. Samantarai, B., and Kabi, T.
**Rooting responses in isolated tropical leaves.**
*Proc. Indian Acad. Sci., Sect. B*, 1954, **39**: 243-8, bibl. 5.

Isolated leaves of 7 tropical species were treated with hormones to determine their rooting response. Indolyl butyric acid (IBA) at a concentration of 2·5 p.p.m. produced the best rooting response in *Ipomoea batatas* and *Pogostemon plectranthoides*; *Amaranthus gangeticus* rooted best at 5 p.p.m., *Helianthus annuus*, *Chenopodium album* and *Cephalandra indica* at 10 p.p.m., and *Boerhavia diffusa* at 20 p.p.m.

4072. Anon.
Papierchromatographische Untersuchungen von Zellsaftfarbstoffen und ihre Bedeutung für die Blütenfarbenzüchtung. (**The paper chromatography of cell sap pigments and their significance in breeding for flower colour.**)
*Ber. Lehr-u.. ForschAnst. Geisenheim/Rhein 1952/53*, pp. 16-22.

In the flowering plants studied the following anthocyanidins were encountered: pelargonidin, paeonidin, cyanidin, malvidin and delphinidin. The relation of these pigments to flower colour in some common ornamental species and their significance in flower breeding are discussed.

4073. Davidson, O. W.
**Foot-candles and green leaves.**
*N.J. Agric.*, 1954, **36** (2): 6-9.

Fertilizer, temperature and water requirements of decorative plants are discussed in general and a table is given grouping popular species of foliage plants according to their minimum requirements of artificial light based on daily illumination for 16 hours.

4074. Wolf, B.
**Plant response to aluminum sulphate.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 114-17, bibl. 32, illus.

Aluminium sulphate was applied to a Florida sandy soil, with pH 6·4 and a low Al content, and gladioli were used as test plants. Plants receiving Al were darker green and produced more flower spikes than the controls. A second experiment was established with chlorotic azaleas, variety Amoena, grown in pots in a sandy loam. Aluminium sulphate applied as a spray had no effect by itself, but when combined with sulphates of iron and magnesium, the resulting spray corrected chlorosis and improved the growth of the azaleas.

4075. Fouarge, E.
Plantes sans terre . . . (**Plants without soil . . .**)
*Bull. hort. Liège*, 1954, **9**: 255-7, illus.

House plants which have been successfully grown in nutrient solution, in decorative vases, include: *Ficus*, *Philodendron*, *Hedera*, *Nephrolepis*, *Asparagus plumosus*, *Peperomia*, *Columnea*, *Saintpaulia*, *Coleus*, *Tradescantia*, *Cyperus*, *Sanseveria* and certain *Anthuriums*.

4076. Kirby, R. S., Burke, O. D., and Nichols, L. P.
**Diseases of commercial florist crops.**
*Circ. Pa Coll. Agric.* **423,** 1954, pp. 36.

The authors deal usefully with the control of diseases on the following flower crops grown under glass and in the open in Pennsylvania. African violet (or saintpaulia), azalea, begonia, calla lily (*Zantedeschia*), carnation, chrysanthemum, cineraria, cyclamen, dahlia, delphinium, gardenia, geranium, gerbera, gladiolus, hydrangea, lily, lily of the valley, narcissus, pansy, peony, poinsettia, rose, snapdragon, stock, sweet pea, tulip and violet. They discuss the use of various fungicides.

4077. Nijveldt, W.
Galmuggen van cultuurgewassen. V. Galmuggen schadelijk voor de sierteelt. (**Gall midges on ornamental plants.**) [English summary ½ p.]
*Tijdschr. PlZiekt.*, 1954, **60**: 152-6, bibl. in text, illus.

Notes are given on the damage caused by *Dasyneura affinis* on *Viola cornuta*, *D. alpestris* on *Arabis alpina*, *D. tortrix* on *Prunus cerasifera* var. *pissardii*, and *Thomasiniana oculiperda* on *Rosa* spp. An addendum to this series of articles [pp. 155-6, and see also *H.A.*, 22: 3674 and 23: 4174] mentions also *Thomasiniana theobaldi* now found in Holland on fruit crops, and *Rhabdophaga triandraperda* on *Salix amygdalina*.

### *Annual and herbaceous plants.*

(*See also* 3397, 3950, 4162f, i, n, u, x, 4163b, g, h, m, 4274, 4450.]

4078. Meahl, R. P., Little, L. D., and Atmore, S.
**1953 zinnia, marigold, and snapdragon trials.**
*Progr. Rep. Pa agric. Exp. Stat.* **122A,** 1954, pp. 16.

Description of flowers resulting from 152 samples of zinnia seed, 73 of marigold and 98 of snapdragon received from 27 American nurseries.

4079. Meahl, R. P.
**New varieties of ornamentals.**
*Sci. for the Fmr*, 1954, **1** (4): 11-12.

Brief descriptions are given of new varieties of alyssum, celosia, morning glory, marigold, petunia, zinnia and rose tested during 1953 at the Pennsylvania Agricultural Experiment Station.

4080. Challenger, S.
**Diseases of alpines.**
*Quart. Bull. Alpine Gdn Soc.*, 1954, **22**: 131-51, bibl. 43.

In such a short article as this any diagnosis of diseases of alpines must be rough and ready, but the author gives a key by which the mildews, rusts, stem rots, viruses, tumours, and flower and fruit abnormalities may be separated. In each section there is a short survey of diseases attacking alpine species, with a few control recommendations.

4081. Joseph, T. C.
**Inhibition of the crown-rot disease fungus, *Sclerotium delphinii* Welch.**
*Nature*, 1954, **173**: 1144-5, bibl. 1, illus.

In an earlier paper the author reported the inhibition *in vitro* of the crown-rot fungus, *Sclerotium delphinii*, by two *Penicillium* spp. [*H.A.*, 22: 3765]. In further experiments he showed that the death rate of *Mazus reptans* and *Ajuga reptans* (two rock plants extremely susceptible to *S. delphinii*) was greatly reduced by treating the infected soil, in which they were planted, with culture filtrates of *Penicillium brevi-compactum* and *P. charlesii*. The practicability of using the two penicillia for crown-rot control has thus been demonstrated.—Fordham Univ., N.Y., and N.Y. bot. Gdn.

4082. Langhans, R. W.
**Carnation cutting storage.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 105, p. 3.

Unrooted carnation cuttings of 4 varieties showed 100% rooting in constant mist after they had been stored for 6 months at 31° F. in bundles of 25 wrapped when dry in cellophane. Rooted cuttings were successfully stored for 4 months at 31° F. provided some of the rooting medium was left on the roots. [See also *H.A.*, 24: 628.]

4083. Kassanis, B.
**Virus diseases of carnation.**
*A.R. Rothamsted exp. Stat. 1953*, 1954, pp. 86-7.

Four distinct viruses have been isolated from commercial stocks of carnations. Two have a thermal inactivation point above 80° F., and plants can be freed from them by exposure to 36° for 14 days. No insect vector has been found for either. The other 2 viruses have a thermal inactivation point below 65°, are transmitted by *Myzus persicae*, and exposure to 36° has not freed plants from either.

4084. Kassanis, B.
**A virus latent in carnation and potato plants.**
*Nature*, 1954, **173**: 1097-8, bibl. 2.

While studying virus diseases of the carnation (*Dianthus caryophyllus*) it was found that some stocks of symptomless carnations contain a virus-like antigen that is transmissible to sweet william (*D. barbatus*) and other plants. Its infectivity and nature are discussed.—Rothamsted.

4085. Armstrong, J. K., and Armstrong, G. M.
**Caryophyllaceae susceptible to the carnation wilt *Fusarium*.**
*Phytopathology*, 1954, **44**: 275-6, bibl. 6.

Six species of *Dianthus*, in addition to *D. caryophyllus*, with several varieties of 2 of these, and *Lychnis chalcedonica* L. were highly susceptible to *F. dianthi*; *Gypsophila paniculata* L. was highly resistant with only internal symptoms; *Cerastium tomentosum* L. showed no symptoms whatever.—S.C. agric. Exp. Stat., Clemson, and U.S. Dep. Agric.

4086. Geoffrion, J.-M.
Les chrysanthèmes. **(Chrysanthemums.)**
La culture du chrysanthème. **(Chrysanthemum growing.)**
*Rev. d'Oka*, 1953, **27**: 139-51; 1954, **28**: 20-4, 40-4, bibl. 74.

Aspects covered include history, classification, varieties in Montreal greenhouses and hardy varieties, propagation, cultural practices, diseases, and insect and other pests.

4087. Langhans, R. W.
**Chrysanthemum cutting storage.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 106, p. 6.

Both rooted and unrooted chrysanthemum cuttings were stored successfully at 31° F. in sealed jars for 6 weeks. After this period some chilling injury developed. Unrooted cuttings kept best when stored dry and rooted cuttings when their roots were kept moist. After storage unrooted cuttings rooted better under mist than under normal propagation.

4088. Capreal, S. H.
**Forcing chrysanthemums for earlier blooms. A review of short day schedule.**
*Gdn J. N.Y. bot. Gdn*, 1954, **4**: 67-70.

It is demonstrated diagrammatically how, by controlling day-length and temperature, chrysanthemum flowers can be produced all the year round. In outdoor cultivation, however, it is only practicable to produce flowers in summer and autumn. To control the time of flowering under these conditions it is necessary to apply a formula of days from planting to bloom comprising, on the average, 15 long days from planting to pinching rooted stock, 30 long days for vegetative growth and 60 short days for bud initiation and development. The third phase will, in fact, range from 7 to 14 weeks depending on variety. Once the short-day response of any given variety has been worked out, the date of blooming can be controlled by applying a short-day timing schedule. Examples of the use of timing schedules are given. A method of constructing a black cloth cover to shorten days is described and certain cultural aspects are discussed.

4089. Cathey, H. M.
**Temperatures classification of chrysanthemum.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 104, p. 1.

Experiments on 6 chrysanthemum varieties grown at various temperatures and with controlled short photoperiods have shown that the varieties fall into the following 3 groups: (1) *thermozero*, in which flowering is not inhibited within the range 50° to 80° F.; (2) *thermopositive*, in which a temperature of 60° F. or more is needed for initiation of flower buds; or (3) *thermonegative* in which a temperature of 60° F. or less is needed for initiation and development.

4090. Keller, J. R.
**Investigations on chrysanthemum stunt virus and chrysanthemum virus Q.**
*Mem. Cornell agric. Exp. Stat.* **324,** 1953, pp. 40, bibl. 32, illus.

Chrysanthemum stunt disease is caused by a virus, which was transmitted by grafts, juice inoculations and the dodder plant (*Cuscuta gronovii*). Stunt virus symptoms appeared 3 to 4 months after inoculation, but this period was reduced to 6 to 8 weeks by defoliation or treatment inducing etiolation. The movement of the virus to other leaves after inoculation did not take place before 35 to 45 days had elapsed. Infectivity was lost after 55 to 60 days at 21° C. The variety Mistletoe, used as a test plant, showed the infection as many distinct white spots. A previously unreported virus, chrysanthemum virus Q, was found in variety Blanche. This virus in combination with stunt virus gave severe distortion. In other varieties, virus Q alone produced definite veinbanding symptoms.

4091. Dimock, A. W., and McFadden, L. A.
**New bacterial disease affects chrysanthemums.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 104, pp. 2-4, bibl. 1, illus.

A technical account of this disease caused by *Erwinia* *chrysanthemi* has already been published [see *H.A.*, 24: 647]. The present paper covers some of the same ground and in addition makes suggestions for control which include: (1) sterilize soil at least once a year, (2) in pinching, taking cuttings or picking blooms snap the stems off instead of cutting with a knife, (3) only dip cuttings in solutions to which a bactericide has been added, (4) note that nutrient-culture methods provide conditions under which the disease may spread particularly rapidly.

4092. Plasman, A.
Le flétrissement des cinéraires causé par *Phytophthora cinnamomi* Rands. **(Cineraria wilt caused by *Phytophthora cinnamomi*.)**
*Bull. hort. Liège*, 1954, **9**: 202-3, illus.

Control of this soil-borne disease may be obtained by soil sterilization with a 2·5% formaldehyde solution, but before sowing or planting the formaldehyde should have evaporated.

4093. Bosian, —.
Vegetative Vermehrung von Gerbera. **(The vegetative propagation of gerbera.)**
*Gartenwelt*, 1954, **54**: 233-4, bibl. 1, illus.

The method usually adopted for the vegetative propagation of gerberas is the division of a mother plant into 5–7 new plants with 2–4 leaves each. In his experiments in 1938 the author carried this technique much further by splitting plants into rhizome and single-leaf cuttings (to which a small piece of rhizome remained attached), with the result that he obtained 40–50 young plants per mother plant. The method is described and illustrated.—Landesanst. f. Wein-, Obst- u. Gartenbau, Neustadt/Weinstr.

4094. Böhnert, E., and Mühlendyck, E.
Sortenbeobachtungen bei "Gloxinien" (*Sinningia* hybrida hort.) als Beitrag zur Klärung der Versuchsanstellung im Blumen- und Zierpflanzenbau. **(Observations on gloxinia varieties and notes on experimentation with flowers and ornamental plants.)**
*Gartenbauwiss.*, 1954, **1***: 59-72, bibl. 1, illus.

In their trials with gloxinia, carried out 1951–53, the authors found that a relationship exists between the vegetative and flowering characteristics of a variety, as for instance between the number of flowers and leaves, the size of flowers (diameter) and leaves, the length of pedicel and petiole, the weight of flowers and leaves, etc. Such close relationships facilitate the scientific evaluation of variety trials besides being a valuable help to the breeder.—Tech. Univ. Berlin-Charlottenburg.

4095. Tattershall, J. T., and Davidson, R. H.
**Life history and control of *Apion longirostre* Olivier.**
*J. econ. Ent.*, 1954, **47**: 181-2, bibl. 3, illus.

From results obtained in Ohio it is concluded that hollyhock weevil, *A. longirostre*, damaging hollyhock only, can be controlled by 0·1% sprays of aldrin, chlordane, dieldrin, DDT, heptachlor and lindane.

4096. Kirk, E. B.
**The peony.**
*Nat. hort. Mag.*, 1954, **33**: 120-33.

The history of the peony in magic and medicine and as a culinary herb and an ornamental is traced back to ancient Greece and China.

4097. Walker, J.
**Antirrhinum rust: all varieties susceptible in N.S.W.**
*Agric. Gaz. N.S.W.*, 1954, **65**: 250, illus.

The race of *Puccinia antirrhini* present in Australia is similar to that known in America as Race 2. There are no known resistant snapdragon varieties.

4098. Beatty, A. V., and Beatty, J. W.
**Immediate effects of 200r and 400r of X-radiation on the microspores of *Tradescantia paludosa*.**
*Amer. J. Bot.*, 1954, **41**: 242-50, bibl. 20.

Comparative studies on the two halves of anthers of *Tradescantia paludosa* were made to determine the immediate effects of X-radiation on the development and division of the microspores. After 400r of X-radiation, given at 50r per minute, there was an initial 5-hour cessation in development followed by an increased rate of development. The microspores irradiated in tetrads and in the first 3 stages following tetrad formation were found to show the greatest effect. The effects of irradiation were most pronounced 4 hours after treatment with 200r and 9 hours after treatment with 400r.

### *Bulbs, tubers, etc.*

(*See also* 3372, 3416, 3422, 3672, 4162m, y, 4163j.)

4099. Crombie, W. M. L.
**Oxalic acid metabolism in *Begonia semperflorens*.**
*J. exp. Bot.*, 1954, **5**: 173-83, bibl. 31.

Experiments made to discover the content and function of oxalic acid in *Begonia semperflorens*, showed that it was only formed during rapid growth, and that once formed it took little further part in metabolism.

4100. Naaldwijk.
Bewaartemperatuurproef met Brodiaea. **(Storage temperature experiment with *Brodiaea*.)**
*Jaarversl. Proefstat. Groent. Fruit. Glas, Naaldwijk*, 1953, p. 29.

Different temperature treatments were started on 13 August, and the corms subsequently planted out. The earliest flowering (on 12 May) was by those stored for 2 weeks at 20° C. and thereafter at 9° C. Corms stored at 17° C., and those held at 20° C. for 2 weeks and then 17° C., produced the greatest numbers of flowers. Storage at 13° C. favoured the production of young corms. Storage at 20° C. and higher for long periods had an inhibiting effect on flower and corm production.

4101. Yee, W.
**Ti culture.**
*Agric. Ext. Circ. Hawaii agric. Ext. Serv.* **344**, 1954, pp. 10, illus.

Notes are given on the cultivation of *Cordyline terminalis* for its ornamental foliage. Twenty-five varieties are described.

---

* New series. Vol. 18 was published in 1945.

4102. HATMAN-DRÖGE, C.
Landelijke proef met cyclamen-potgrondmengsels. **(A country-wide experiment on potting composts for cyclamen.)** [English summary ½ p.]
*Meded. Dir. Tuinb.*, 1954, **17**: 468-77, bibl. 5.

In 1951 and 1952, at 4 horticultural experiment stations in the Netherlands, experiments were made on the growth and lasting qualities of cyclamen, variety Perle von Zehlendorf, grown in the following soil mixtures: Aalsmeer compost of 4 parts lake peat, 2 leaf mould, 2 manure and 1½ sand; Lent compost of 4 parts loam, 1 manure and some leaf mould; a compost of 3 parts leaf mould to 1 manure; Berkel compost of 3 parts sandy lake soil to 1 manure. In 1951 the Aalsmeer compost was steamed to 90° C., in 1952 it was steamed to 100° and 82° C., and Berkel compost was also steamed to 82° C. In 1951 the composts of leaf mould and of loam were best; in 1952 the Aalsmeer compost showed the best results at 2 of the stations, and Berkel compost at 3 stations, the leaf mould compost being less satisfactory. Steaming had an adverse effect. It appeared that none of the composts had any intrinsic effect on the lasting qualities of cyclamen under living-room conditions.

4103. RAMSFJELL, T., AND ULDAL, B.
Bekjempelse av rotsvartsopp på cyclamen. **(Black root rot control in cyclamen.)**
*Gartneryrket*, 1954, **44**: 333-4, illus.

It is suggested that the black root rot fungus [*Thielaviopsis basicola?*] causes more damage to cyclamen in Norway than growers realize. Of the treatments tested in two years' trials steam sterilization and soil fumigation with chloropicrin or formaldehyde proved effective for the control of the disease. Whether and to what degree damage is caused by the fungus appears to depend on such factors as time of attack, temperature, soil structure and soil moisture.

4104. NAALDWIJK.
Bewaartemperatuurproef met Freesia. **(Storage temperature experiment with freesia.)** "Verpoppen" van Freesiaknollen. **(Vegetative propagation with freesia corms.)**
*Jaarversl. Proefstat. Groent. Fruit. Glas, Naaldwijk*, 1953, pp. 28-9.

Two experiments are reported on the effects of storage temperatures on freesia corms. In the first, corms of the varieties Buttercup, Blauwe Wimpel, Oranje Zon, Snow Queen and White Madonna stored for 11 to 13 weeks at 31° C. gave the best flowers. The second experiment was aimed at discovering the optimum conditions for the production of small corms and for their storage; previous results showing that young corms were formed most quickly at 13° C. were confirmed. Corms kept at 30° C. for no longer than 12 weeks subsequently propagated themselves successfully at 13° C. The best plants developed from young corms formed under the following storage conditions: either in a bulb storage shed; in the bulb shed until 1 January, then for 13 weeks at 30° C.; or at a constant temperature of 13° C.; at 13° C. until 1 January, then 13 weeks at 30° C. Cormlets of the varieties Buttercup, Blauwe Wimpel, Oranje Zon, Prinses Marijke and Caro Carlee, so treated, flowered between mid-November and mid-December.

4105. ŠAROVA, N. L.
**An experiment on foliar nutrition of gladiolus.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1954, **94**: 153-6, bibl. 11, illus.

Gladiolus, var. Picardy, was grown under the following fertiilzer treatments: NPK applied to the soil, ammonium nitrate and superphosphate in 0·2% aqueous solution applied to the leaves 7 times during the season, and a combination of the two applications. Foliar nutrition, especially when combined with soil application, as compared with soil application alone, extended the flowering period, produced a larger number of flowers per spike and increased the size of the lower flowers. Colour remained unaffected. The sprays caused some modification of leaf structure, increased the metabolic activity of the leaves, and had a most pronounced effect on corm production.

4106. WOLTZ, S. S., MAGIE, R. O., AND GERALDSON, C. M.
**Studies on leaf scorch of gladiolus.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 306-9, bibl. 4, illus.

Preliminary studies made on leaf scorch of gladiolus in parts of Florida suggest that this physiological disorder may be due to the presence of fluorine compounds in the atmosphere. It was shown that leaf scorch was associated with high fluorine accumulation n leaf tips.

4107. FORSBERG, J. L.
**The fusarium disease of gladiolus.**
*Diss. Abstr.*, 1954, **14**: 901, being *Publ.* 7843 of 102 pp.

Evidence indicates that the strains of the gladiolus fusarium are extremely variable and some apparently quite unstable. It is proposed that all forms should be included under the name *Fusarium oxysporum* f. *gladioli* (Massey) Snyder and Hansen.

4108. MAGIE, R. O.
**Gladiolus corm treatments in the control of fusarium rot.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 318-21, bibl. 5.

Many tests were made using chemotherapeutant and antibiotic materials for the control of fusarium rot (*Fusarium oxysporum* f. *gladioli*) on corms and roots of gladiolus, variety Picardy. Good disease control was obtained by placing pre-soaked corms in 0·25% streptothricin HC1 or 0·08% Vancide F845 for 30 minutes, during 1 minute of which a vacuum of 22 lb. was maintained. Methylcellulose treatment in which fungicides were made to adhere to the corms, resulted in good disease control with 2 experimental chemotherapeutant compounds. Corms soaked for 3 days before planting in 0·02% Crag fungicide 974 or 0·5% captan also showed good disease control. Promising disease control was obtained when freshly harvested plants were placed upright for 3 hours in shallow pans containing 0·05% Vancide F845, 0·01% CP4367, or 1 g. Phygon XL in 10 ml. ethanol diluted with 30 litres of water. Complete control of fusarium rot was not obtained by chemicals, and the maintenance of healthy corm stocks is important.

4109. Schenk, P. J.
Het vuur van *Hippeastrum*. (**Hippeastrum fire.**)
*Cult. Hand.*, 1954, **20**: 279-80, illus.

*Hippeastrum* fire, caused by *Stagonospora curtisii*, appears on the flower stem as rows of spreading red to brown spots or cracks. Control may be obtained by spraying the stem with 0·75% copper oxychloride, or by warm water treatment of the bulb at 43·5° C. for 2 hours.

4110. Nizi, G.
Disinfestazione dei bulbi di giacinto proveniente dall'Olanda e influenza esercitata sugli stessi dagli antiparassitari sperimentati. (**The disinfestation of hyacinth bulbs imported from Holland and the effect on them of the insecticides used.**) [English summary ½ p.]
*Ann. Sper. agrar.*, 1954, **8**: 1323-36, bibl. 13, illus.

In disinfestation tests in 1951/52 and 1952/53 Dutch hyacinth bulbs heavily infested with the bulb mite *Rhizoglyphus echinopus* were fumigated with parathion and carbon disulphide, dipped in or dusted with various insecticides, or manured with a microelement fertilizer. None of the treatments was entirely efficacious, the mite always persisting through the escape of adults or eggs. Apart from carbon disulphide which killed them, none of the compounds used had any significant effect on the bulbs. Recommended control measures are the selection of resistant varieties and strict frontier inspection.—Osserv. fitopat., Perugia.

4111. Cathey, H. M.
**Effect of air-soil temperature on the flowering of Wedgewood iris.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 106, pp. 3-4, bibl. 2, illus.

During the winter of 1952/53 Wedgewood iris bulbs were planted on 6 dates between November and March and forced at night air temperatures of 40° and 50° F. and soil temperatures of 40° or 50°, 65° and 80° F. The earliest flowering resulted from the use of the 80° F. soil and 50° F. air temperatures, but the percentage of flowers produced was relatively low. The 65°/50° temperature combination resulted in nearly as rapid flowering and in a consistently high percentage of flowers. High soil temperatures reduced the amount of foliage produced, in terms of both fresh and dry weights. When some plants growing at the 80°/50° combination were transferred after about 3 weeks to a uniform 50°/50° temperature the percentage of flowers produced was higher than when soil temperature was kept at 80° F. throughout the forcing period.

4112. de Oliveira, W.
Açucenas. (**Lilies.**) [English and French summaries 16 and 15 lines.]
*Bol. Junta nac. Frutas*, 1952, **12**: 132-79, bibl. 18, illus.

Notes on the culture and propagation of the genus *Lilium* with special reference to 14 important species and their varieties.

4113. Milbrath, D. G.
**Fleck of Easter lily.**
*Bull. Calif. Dep. Agric.*, 1950, **39**: 3, bibl. 2, illus. [received 1954].

Fleck of *Lilium longiflorum* is caused by a virus complex consisting of 2 components, neither of which alone affects the plant. The symptoms are described and illustrated. The only known vector of the complex is *Aphis gossypii*.

4114. Andison, H.
**The narcissus bulb fly and its control in British Columbia.**
*Publ. Canada Dep. Agric.* **905**, 1954, pp. 7, illus.

This revision of an earlier publication [see *H.A.*, 21: 2867] describes a new preventive treatment against *Lampetia equestris* in which the bulbs are treated at planting time with aldrin or chlordane either by dusting or spraying in the furrows or by soaking in a cold water mixture.

4115. Robson, J. W., and Lindley, C. D.
**Progress report on BHC control of bulb fly.**
*Grower*, 1954, **42**: 343-5.

The larvae of the narcissus bulb fly [*Merodon equestris*] can be controlled by dipping the bulbs in BHC solution. Good control was obtained by soaking dormant bulbs in a solution of 4 pts of liquid BHC in 100 gal. water for 3 hours. Varieties successfully treated were Forerunner, Fortune, King Alfred, Carlton, Flower Record, Sole Mio, Scarlet Elegance, Brandon, Cavalliero and Cragford.

4116. Frylink, A.
**The tulip. Part I. Its early history. Part II. The development of the modern tulip.**
*Gdn J. N.Y. bot. Gdn*, 1954, **4**: 5-7, 15, and 47-51, illus.

In Part I the author traces the history of the tulip from the twelfth century, through the extraordinary "Tulipomania" of Holland in 1634–1637 when tulip bulbs were weighed and sold like precious stones, up to modern times. In Part II he describes the 16 groups into which tulip varieties are now separated.

4117. Dickey, R. D.
**Growing tulips in northern Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 331-3.

Experiments were carried out to determine the effects of cold storage on the flowering of tulips to be planted in Florida. Satisfactory flowering was obtained after storage within a temperature range of 40° F. to 50° F. and a time range of 60 to 120 days, starting in late September or early October. Storage at room temperature for 30 days before 60 days storage at 40° F. did not injure the bulbs, but 60 days at room temperature caused significantly reduced flowering. Bulbs which had been cold stored at 40° F. for 60 days could be kept at room temperature for at least 7 days before planting without injury.

4118. Silina, Z. M.
**The culture of tulips in the Leningrad region.** [Russian.]
*Trudy bot. Inst. Akad. Nauk S.S.S.R., Ser. VI*, 1953, pp. 5-146, bibl. 71, illus.

The growth, development and vegetative propagation of cultivated tulips under Leningrad conditions is discussed. The Botanic Garden of the Komarov Institute of the Academy of Sciences U.S.S.R. has at present a collection of 166 cultivated and 20 Central Asian wild varieties of tulip. A description is given of some 80 cultivated varieties, many of which are illustrated in colour.

4119. Beijer, J. J.
**De ontwikkelingsstadia van de tulp. (Stages in development of tulip bulbs.)**
[*Publ.*] *Lab. Bloemboll. Lisse* **92,** 1952, pp. 7, illus.

A technique of dissecting tulip bulbs is described, which enables the exact stage of development of the tulip flower within to be seen. A short description and excellent photographs of each stage are given. The method has a practical use in the sampling of bulbs during storage treatment for forcing.

### *Lawns.*

(*See also* 4162j.)

4120. Musser, H. B.
**Lawn grass easily chosen.**
*Sci. for the Fmr*, 1954, **1** (4): 13-14, illus.

New selections of lawn grasses for Pennsylvania are described briefly. Merion, a strain of Kentucky bluegrass, is tolerant to the common leafspot diseases, and stands mowing better than common bluegrass, owing to its vigorous low growth. Delta is another vigorous bluegrass strain, which is adapted to the cooler sections of the Kentucky bluegrass region. Illahee and Trinity, 2 red fescue strains, will make good turf under cool conditions. The characteristics of several other grasses are mentioned.

4121. Hargreaves, D. B., and Gibson, H. V.
**Heavy duty aeration.**
*J. Pk Admin.*, 1954, **18**: 547-9, illus.

Observations are made on the use of heavy machinery to aid surface drainage and turf formation on areas of sports turf that have been subjected to surface compaction. Penetration by implements down to 4 in. is common practice but is insufficient under some conditions. Two types of rotating tine have been developed, the one a large flat one capable of deep penetration and the other a chisel-shaped root-development tine making a shallower but larger and uncompacted hole. These tines are illustrated together with penetration diagrams based on plaster casts of holes made by them.

4122. (Crider, F. J.)
**Lay off the grass.**
*Agric. Res.*, 1954, 3 (1): 1, illus.

Tests were made on the effects of cutting cool-season and warm-season grass species. After a single cut which removed most of the foliage root growth stopped, generally within 24 hours, and for 6 to 18 days. When 50% of the foliage was removed by a single cut, 2% to 4% of the roots stopped growing for 14 days; after a 90% foliage cut root growth was stopped entirely for 17 days, and 40% of the roots were still inactive after 33 days. More frequent cutting gave even more severe results. All root growth during a 33-day test period was stopped in grass of which 70% or more of the foliage was first cut, followed by cutting 3 times weekly to the same height.

4123. Hallowell, C. K.
**Merion bluegrass.**
*Gdn J. N.Y. bot. Gdn*, 1954, **4**: 57-8.

The Merion strain of bluegrass, originally known as B-27, has shown outstanding qualities as a turf grass. When sown alone not more than 2 lb. seed are needed per 1,000 sq. ft. It is, however, slow to germinate and the inclusion of an upright bent grass is desirable. Tests have shown Merion+5% or 10% Highland bent and 40% Merion+50% improved fescue+10% polycross bent to be suitable mixtures. Merion can also be mixed with warm season grasses such as Zoysia and U-3 Bermuda. Notes are given on watering, manuring, mowing, diseases and pests.

4124. Kelsheimer, E. G., and Overman, A. J.
**Notes on some ectoparasitic nematodes found attacking lawns in the Tampa Bay area.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 301-3, illus.

Several nematode species have been found associated with stunted, chlorotic or dead patches of St. Augustine and bermuda grass in lawns in Florida. Attempts are being made to find a nematocide which can be safely applied to established lawns, but in the meantime it is suggested that affected patches and healthy grass 3 to 4 ft. beyond their margins be treated with EDB or D-D, and the treated areas replanted with healthy grass using carefully cleaned tools.

### *Orchids.*

(*See also* 4162e, 4163 l.)

4125. Mott, R. C.
**Effect of soil mixtures on root growth of cymbidium orchids.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 106, pp. 2-3, illus.

Cymbidium orchids were grown for 2 years in 10 different media, including clay soil, moss peat, sedge peat, sawdust and manure alone or in various mixtures, and the standard mixture of osmunda, leaf mould and manure. A 20-20-20 fertilizer was applied in solution at 1 oz. per gal. every 3 weeks. The plants survived in all the media, but, on a basis of the amount and condition of the roots and the colour of the leaves, the best material was moss peat followed by sawdust, sedge peat and soil plus moss peat.

4126. Mott, R. C.
**Frequency of watering of cattleya—1953.**
*Bull. N.Y. St. Flower Grs*, 1954, No. 105, p. 2, illus.

As in a previous trial [*H.A.*; 23: 4459] cattleya orchids grown in osmunda produced more pseudo bulbs and flowers when watered daily than when watered less frequently or when grown with water constantly standing in the lowest one-third of the pot. The variety used was the hybrid *C. brunoyensis* and not, as stated in the earlier paper, *C. labiata* var. *amesiana*.

4127. Cory, E. N., Haviland, E. E., and Atcheson, W. C.
**Injury to cattleyas by an eriophyid mite.**
*J. econ. Ent.*, 1953, **46**: 1096-7.

A mite of the genus *Aceria*, injuring cattleyas in a greenhouse of the University of Maryland, was controlled by a spray of Triton X100. Lime-sulphur at 2 tablespoonfuls per 1 quart of water gave over 50% control.

### *Succulents.*

(*See also* 4162p.)

4128. Esteves-de-Sousa, A.
**On the action of synthetic phytohormones upon the flowering stimulus of *Bryophyllum daigremontianum.***
*Portugal. Acta biol.*, 1953, **3**: 323-34, bibl. 8.

The effect of synthetic growth substances with or without photoperiodic induction on the annual rhythm of *Bryophyllum daigremontianum* was studied in experiments initiated at the Lisbon Botanical Institute in early April, May, June, July and August 1950. Prolonged short-day photoperiodic induction had a greater effect than the growth substances on the appearance of the inflorescence (not flower) primordia but when the primordia appeared long before August their development soon became arrested or retarded until August when the flowering process was resumed. Antiauxins advanced and auxins retarded flowering, the advances and delays being more pronounced when the treatments were applied near August, and being respectively added to and reduced by photoperiodic inductions.

4129. Resende, F.
Tumores produzidos pelo acide 2,3,5-triiodobenzoic (ATIB) em *Bryophyllum daigremontianum.* (**Tumours produced in *Bryophyllum daigremontianum* by 2,3,5-triiodobenzoic acid.**)
*Bull. Soc. Port. Ciẽn. nat.*, 1952, **4** (1): 157-8, illus., from abstr. in *Biol. Abstr., Sect. D*, 1954, **28,** No. 6885.

0·01% TIBA acts on *Bryophyllum daigremontianum* as an auxin, but at 0·05% it caused tumours on the stem and leaf of flowering specimens.

4130. Resende, F.
Observações sobre ritmo endonómico vegetal em Portugal e suas colónias. III. Estado floral e órgãos vegetativos, sua interacção. (**Observations on plant growth rhythm in Portugal and its colonies. III. Floral stage and vegetative organs, their interaction.**)
*Bol. Soc. Port. Ciẽn. nat.*, 1952, **4** (1): 140-56, illus., from abstr. in *Biol. Abstr., Sect. D*, 1954, **28,** No. 11951.

Cases are quoted in *Bryophyllum daigremontianum* and several other species in which part of the plant is at one stage and another part at another stage of growth.

4131. Schnack, B., and Fehleisen, S.
Nota sobre el origen de la marginas amarillas en las hojas de "*Sansevieria thyrsiflora*" Thunb. (**Note on the cause of yellowness of leaf margin in *Sansevieria thyrsiflora.***) [English summary 11 lines.]
*Rev. Fac. agron. Eva Perón*, 1953, **29**: 149-56, bibl. 6, illus.

Evidence is presented to show that the cause of the yellowness of the leaf margins in the ornamental *Sansevieria thyrsiflora albomarginata* is a virus.

### *Roses.*

(*See also* 3416, 3617, 4016-4018, 4162k, 4163k.)

4132. Strømme, E., and Falk, K.
Rotekte og podede veksthusroser sammenliknet i dyrkingsforsøk. (**A comparison of grafted glasshouse roses with roses grown on their own roots.**)
*Gartneryrket*, 1954, **44**: 465-8, bibl. 3, illus.

Six years' trials showed that yields and quality of Better Times roses raised from cuttings were as high as those of plants worked on *R. canina* and *R. manetii* rootstocks. For reasons of economy it is therefore preferable to propagate glasshouse roses from cuttings.

4133. Strømme, E., and Falk, K.
Dyrking av roser i vasstette senger med ulike vatningssystem. (**Methods of watering roses in concrete beds.**)
*Gartneryrket*, 1954, **44**: 367-70, bibl. 4, illus.

The rose varieties Better Times and Rapture were grown on their own roots in concrete beds filled with soil overlying gravel. In 6 years' trials the following methods of watering the plants were compared: (1) hose, (2) sub-irrigation, (3) constant water level. Better Times gave equally high yields with all three systems, but (3) resulted in a somewhat reduced yield of Rapture. The root system of both varieties was less vigorous in (3) than in (1) and (2).

4134. Jenkins, W. R.
**Pathogenic races of *Diplocarpon rosae*, the rose blackspot fungus.**
From abstr. in *Phytopathology*, 1954, **44**: 389.

Nineteen distinct pathogenic races were distinguished among 22 isolates from 17 different places in the United States.

4135. Schindler, A. F.
**Root galling associated with dagger nematode, *Xiphinema diversicaudatum* (Micoletsky, 1927) Thorne, 1939.**
From abstr. in *Phytopathology*, 1954, **44**: 389.

In a survey of nematode diseases of greenhouse-grown roses in the north-eastern U.S.A. it was found that galling of the roots—characteristically an enlargement of the tip and curling of the end—was associated with infections of the dagger nematode and was not due to root-knot nematodes, *Meloidogyne* spp. Galls or "curly-tips" have also been produced in seedlings of tomato, okra, cucumber and balsam in soil infested with the dagger nematode.

4136. Kristoffersen, T.
Forsøk med å forlenge holdbarheten av avskårne roser. (**Prolonging the life of cut roses.**)
*Gartneryrket*, 1954, **44**: 407-13, 417, bibl. 20, illus.

The flowers of cut roses opened more easily and remained fresh for a longer time if part of the bark of the bottom 10–15 cm. of the stem was removed by scraping. The depth of the water did not matter so long as the scraped part of the stem was covered. The addition to the water of a teaspoonful of commercial vinegar and of 50–75 g. sugar per litre had a beneficial effect on bud opening and keeping quality. The experiments were carried out for 4 years, 2,500 roses being used in the many treatments tested.

### *Other trees and shrubs.*

(*See also* 4022, 4162a-d, g, h, o, q, s, t, z, 4163c, e, 4494g.)

4137. Mathias, M. E.
**The ten best trees for desert planting.**
*Proc. nat. Shade Tree Conf. 1953*, pp. 209-13.

More than 10 species, including coniferous evergreens, are described as suitable for the desert areas of western North America.

4138. Wyman, D., and others.
**Vines for every purpose.**
*Brooklyn bot. Gdn Rec.*, 1954, **10**: 1-79, illus.

The whole of this number of the Journal is devoted to a series of articles on vines and creepers used as ornamentals throughout the United States. Many species are described and illustrated and suggestions are made on where and how to plant them.

4139. Andronov, N. M.
**Hardiness of trees and shrubs in Leningrad.** [Russian.]
*Trudy bot. Inst. Akad. Nauk S.S.S.R., Ser. VI*, 1953, pp. 165-220, bibl. 2.

A list is given of 94 gymnospermous and 694 angiospermous woody species grown in the dendrological garden of the Kirov Forest-technical Academy, with notes on size, seed production, origin, ornamental value and degree of winter hardiness following the very severe winter of 1939–40. In comparing the results of frost resistance observations with results published in 1917 it was found that the hardiness of many species had improved during their course of development. [See also *H.A.*, 24: 2984.]

4140. Železnova-Kaminskaja, M. A.
**Results of introducing exotic conifers into Leningrad and its environs.** [Russian.]
*Trudy bot. Inst. Akad. Nauk S.S.S.R., Ser. VI*, 1953, pp. 221-85, bibl. 114.

An extensive study of introduced ornamental conifers with special reference to their hardiness and resistance to atmospheric pollution.

4141. Barton, L. V.
**Effect of presoaking on dormancy in seeds.**
*Contr. Boyce Thompson Inst.*, 1954, **17**: 435-8, bibl. 4.

Seeds of *Malus sylvestris*, *Pinus contorta*, *Pinus ponderosa* and *Berberis thunbergii* were pre-soaked under varying conditions of temperature, amount of water, and length of treatment, and then stratified. From subsequent germination percentages it was shown that *Malus* seeds were more dormant than any of the others. Germination in all species after 4 weeks of stratification may have indicated a slight hastening of after-ripening by pre-soaking for 14 days, otherwise pre-soaking neither hastened the after-ripening process nor increased germination. Freshly harvested seeds of *Aronia arbutifolia*, *Euonymus rotundifolia*, *Malus niedwetzkyana*, *Myrica carolinensis*, *Physocarpus opulifolius*, *Pinus resinosa* and *Pinus strobus* were pre-soaked for 48 hours at 25° C., then stratified at 5° C. for various periods, and planted in soil in a greenhouse. *Myrica* showed some advantage from pre-soaking but only after 12 weeks of stratification. None of the other species responded.

4142. Haskell, T.
**Practical blossom control for the arborist.**
*Proc. nat. Shade Tree Conf. 1953*, pp. 4-17, illus.

Work on preventing fruit formation on shade and ornamental trees at Lansing, Michigan, is discussed. It was found that in species where the flowers open before the leaves, such as cottonwood (eastern poplar), elm and red maple, and where the flowers open after the leaves, catalpa, and horse chestnut, blossom control with chemicals was comparatively easy, but where the flowers and leaves open at the same time, as in Norway and sugar maples, some damage was caused to foliage. Of the materials used, dinitro compounds and growth substances, particularly NAA, showed most promise.

4143. Schread, J. C.
**Control of the andromeda lace bug and the holly leaf miner.**
*Bull. Conn. agric. Exp. Stat.* **568,** 1953, pp. 13, bibl. 5, illus.

The lace bug (*Stephanitis globulifera*) of andromeda (*Pieris* spp.), was fairly easily controlled by DDT, chlordane and 5 other insecticides tested. *Phytomyza ilicis*, the leaf miner of *Ilex opaca*, was controllable by dieldrin or DDT.

4144. Bloemsma, D.
Belichtingsproeven bij azalea's. (**Artificial illumination of azaleas.**) [English summary ½ p.]
*Meded. Dir. Tuinb.*, 1954, **17**: 513-18, illus.

Commercial varieties of azalea were used in 3 experiments on forcing by artificial light. 1. Plants lit at a rate of 80 W. per sq. m. for 16 hours starting on 13 December were in a saleable condition 26 days later, viz. 15 days earlier than the controls. 2. Plants at the same illumination rate but starting on 17 January were ready for sale 24 days later, and 10 days before the controls. 3. Plants which received 100 W. per sq. m. for 16 hours starting from 16 March were ready 20 days later, 6 days before the controls. No difference in quality between lighted plants and controls was apparent, but lighted plants lasted better under living-room conditions.

4145. Schread, J. C.
**Boxwood pests and their control.**
*Bull. Conn. agric. Exp. Stat.* **565,** 1953, pp. 12, bibl. 4, illus.

The biology is described of the following pests of boxwood in Connecticut; the boxwood leaf miner (*Monarthropolpus buxi*), the boxwood psyllid (*Psylla buxi*), and the mites *Tetranychus bimaculatus* and *Simplinychus* (*Neotetranychus*) *buxi*. Experiments indicate that lindane (25% emulsion) applied not later than 15 May at 1 pt per 100 gal. water should kill leaf miner larvae and also control the psyllid. DDT (25% emulsion) applied late in May at 1 pt per 100 gal. should kill adult leaf miners. Aldrin, chlordane and dieldrin were less effective against both pests. Chlorophenylchlorobenzene sulphonate at 1 lb. 50% wettable powder per 100 gal. gave excellent control of mites.

4146. Golden, A. M.
**Pathogenicity of a spiral nematode (*Helicotylenchus* sp.) attacking boxwood.**
From abstr. in *Phytopathology*, 1954, **44**: 389.

The ectoparasitic nematode, *Helicotylenchus* sp., is an important factor in the unhealthy condition of many boxwood plantations in Maryland and the surrounding states, especially in hot or dry weather. It causes excessive bronzing of the leaves, stunting of the root system and lack of vigour.

4147. Gammon, E. T.
**Methyl bromide fumigation of camellia cuttings.**
*Bull. Calif. Dep. Agric.*, 1950, **39**: 125-8 [received 1954].

Tests with cuttings and graftwood of 4 camellia varieties showed that fumigation with methyl bromide was not directly responsible for losses experienced with material shipped into California from other states. The data suggested a possibility that some varieties may be slightly intolerant to high temperatures, and a 3 lb. dosage at 70° F. should therefore be preferable to 2½ lb. at 80° F. Losses could be minimized by reducing the delay between securing cuttings and their propagation and by careful handling.

4148. Sherrer, J. D., and Arant, F. S.
**Effect of certain systemic compounds on southern red mite infesting camellias.**
*J. econ. Ent.*, 1953, **46**: 1116-17, bibl. 2.

In greenhouse trials in Alabama soil applications of systox and its analog, Compound 21/116, were highly effective against southern red mite, *Paratetranychus ilicis*, on camellias. Compound 21/116 at 3 lb. per acre and systox at 5 lb. killed more than 90% of the mites 1 week after treatment and were still effective 3 weeks later. Schradan, also used in these tests, gave less satisfactory results.

4149. Scaramuzzi, G.
Sul seccume delle foglie d'ippocastano. **(On leaf desiccation in the horse chestnut.)** [English summary 6 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 1265-81, bibl. 18, illus.

A description is given of 2 forms of leaf desiccation in the horse chestnut. The more widespread, present in many parts of Italy and elsewhere, is due to *Guignardia aesculi*. In the case of the second, of which the cause is unknown, desiccation is generally confined to the leaflet margins and affected trees often show short dense branch growth.—Lab. crit. ital., Pavia.

4150. Torgeson, D. C., Young, R. A., and Milbrath, J. A.
**Phytophthora root rot diseases of Lawson cypress and other ornamentals.**
*Stat. Bull. Ore. agric. Exp. Stat.* **537**, 1954, pp. 18, bibl. 2, illus.

Root rot diseases of *Chamaecyparis lawsoniana* varieties, caused by 2 species of *Phytophthora* kill many plants on the Pacific Coast. *Phytophthora lateralis* attacks only *Chamaecyparis* spp., whereas *P. cinnamomi* attacks a wide range of ornamental conifers and broadleafed plants. Lists of plants susceptible and resistant to both species are given. For control, growing disease-free propagation stock in uninfected soil is recommended. Chemical treatment and the use of resistant rootstocks proved impracticable. [See also *H.A.*, 24: 2995.]

4151. Schmidt, H. A.
Schäden durch Hitzeeinwirkung bei Gummibaumstecklingen. **(Heat injury to cuttings of rubber plants.)**
*NachrBl. dtsch. PflSchDienst, Berlin*, 1954, **8**: 96-7, illus.

A malady of ornamental *Ficus* cuttings attributed to attack by fungi was later diagnosed as heat injury when it was observed that in all plants the epidermis of the leaf had become detached from large areas of the lamina.

4152. Kuitert, L. C.
**Use of demeton (systox) for controlling insects of ornamentals.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 321-3, bibl. 3, illus.

Demeton was applied either as a soil drench or as a spray to potted gardenia cuttings. Good control of aphids was observed after 24 hours, and of adult whitefly after 5 days; there was also an indication that root-knot nematode was controlled. Plants which had received high application rates of demeton showed considerable burning of foliage 6 weeks after application.

4153. Turner, H. E.
**Practical blossom [ginkgo fruit] control for the arborist.**
*Proc. nat. Shade Tree Conf. 1953*, pp. 17-20.

Among several methods tested for removing the flowers and odoriferous fruits of the ginkgo, directing a water stream against the fruits from a 2-in. fire hydrant under 90 lb. pressure was most satisfactory.

4154. Griesel, W. O.
**Retardation of maturation in magnolia flowers by maleic hydrazide.**
*Science*, 1954, **119**: 843-5, bibl. 5, illus.

Commercial forms of the diethanolamine salt of maleic hydrazide, at concentrations of 5%, 8% and 10%, were applied as a spray to opening flowers, or in lanolin paste and by painting to separate perianth segments of *Magnolia grandiflora*. Treated flowers and perianth segments remained white and turgid much longer than untreated flowers and segments, which browned and shrivelled. Maleic hydrazide applied after the loose bud stage showed a decrease in effectiveness. Cytological examination showed the response to be related to the large amount of starch present in the perianth in its early stages, which decreased with maturation.

4155. Yunker, T. G.
**A new ornamental peperomia from Venezuela.**
*Brittonia*, 1954, **8**: 61-3, illus.

A taxonomic description is given of *Peperomia ornata* Yuncker sp. nov., which should become popular as an ornamental house plant.

4156. Keller, J. R.
**Conditions influencing *Thielaviopsis* root rot of poinsettias.**
From abstr. in *Phytopathology*, 1954, **44**: 389.

A significant decrease in top weight occurred when root rot was caused by *Thielaviopsis basicola* alone or in combination with *Rhizoctonia* or *Pythium* but none was obtained with *Rhizoctonia* or *Pythium* alone or together. Pathogenicity tests showed that distinct *Thielaviopsis* strains may exist.

4157. Rhododendron-Gesellschaft, Bremen.
*Rhododendron und immergrüne Laubgehölze. Jahrbuch 1954.* **(Rhododendron and evergreen woody plants. Yearbook 1954),** Rhododendron-Gesellschaft, Bremen, 1954, pp. 64, bibls., illus.

The yearbook includes articles on the propagation of rhododendrons from cuttings, recent advances in American rhododendron culture, evergreen woody plants in the subtropical winter rainfall area of central Chile and the evolution of the genus *Rhododendron*.

4158. Bavaud, J.
Multiplication des rhododendrons. **(Rhododendron propagation.)**
*Rev. hort. suisse*, 1954, **27**: 231-2, illus.

A short description is given of the nursery methods employed in German Friesland, where rhododendrons are raised extensively under the natural shade of forests.

4159. Paton, M. R.
**Petal blight of rhododendron in Scotland.**
*Plant Path.*, 1954, **3**: 50, bibl. 3, illus.

Petal blight of rhododendron caused by the fungus *Ovulinia azaleae*, first found in Scotland in 1950, is now known to be well established along the Solway coast, and in 1953 was found in Perthshire. Affected bushes were usually hybrid rhododendrons and azaleas flowering at the beginning of June, although the fungus has also been seen on the late-flowering *Rhododendron discolor*. Infection appears as spots on the inside of the corolla lobes, the petals subsequently dry out and remain on the truss until the autumn.

4160. Grant, P. J.
**Tree-ferns of New Zealand.**
*N.Z. Gdnr*, 1954, **10**: 609-13, 624, illus.

A brief classification of native tree-ferns, namely 3 *Dicksonia* spp. and 5 *Cyathea* spp.

4161. Herre, H.
***Welwitschia mirabilis* Hook from seed to seed in the botanic garden of the University of Stellenbosch, C.P.**
*J. S. Afr. Bot.*, 1954, **20**: 23-4, illus.

This extraordinary dioecious plant, a native of S.W. Africa and Angola, is the only member of the family Welwitschiaceae which is placed between the Gymnospermae and the Angiospermae. Although it may live for over 1,000 years and attain a stem diameter of 15 ft., it produces, in addition to 2 cotyledons, only 2 true leaves. These leaves continue to grow at the base and wear away at the tips. The tap root produced by seedlings grows very rapidly, sometimes penetrating to depths of 60 ft. in search of water. Natural pollination is effected by a bug. Female seedlings grown at Stellenbosch produced cones after 23 years and set seed with hand pollination. Some of the seeds germinated readily.

### *Noted.*

4162.

a Baud, C.
Quelques essais de pommiers d'ornement. **(Some trials with ornamental apples.)**
*Rev. hort. suisse*, 1954, **27**: 267-8.
Eight varieties are recommended.

b Beaumont, A.
**Diseases of rhododendron.**
*Gdnrs' Chron.*, 1954, **136**: 15.
In Britain.

c Carter, J. C.
**Fungicides for use on shade and ornamental trees.**
*Proc. nat. Shade Tree Conf. 1953*, pp. 118-23.

d Charon, —.
Les plántes grimpantes vivaces en Algérie. **(Hardy climbing plants in Algeria.)**
*Rev. hort. Algér.*, 1954, **58**: 56-73, bibl. 2.

e Curtis, J. T.
**Annual fluctuations in rate of flower production by native cypripediums during two decades.**
*Bull. Torrey bot. Cl.*, 1954, **81**: 340-52, bibl. 24.

f Griffin, J. F., Jr.
**New hybrid crotons.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 314-18.
14 varieties described.

g Harkness, B.
**A new hybrid magnolia.**
*Nat. hort. Mag.*, 1954, **33**: 118-20, illus.
Slavin's Snowy (*M. salicifolia* × *M. soulangeana*).

h Janaki Ammal, E. K.
**The cyto-geography of the genus *Buddleia* in Asia.**
*Sci. and Cult.*, 1954, **19**: 578-81, bibl. 8, maps.

i Kallauch, W.
Sorten-Vergleichsanbau bei Chrysanthemum maximum und Chrysanthemum leucanthemum. **(Comparative trials with varieties of *Chrysanthemum maximum* and *C. leucanthemum*.)**
*Süddtsch. ErwGärtn.*, 1954, **8**: 21-5.
At Höhere Gartenbauschule, Osnabrück.

j Kelsheimer, E. G.
**Granular insecticides.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 311-13.
Tests of chlordane and dieldrin against lawn pests.

k KRÜSSMANN, G., AND OTHERS.
Gebrauchsliste der in den deutschen Baumschulen kultivierten Garten- und Wildrosen. (**A list of wild and garden rose varieties in stock in German nurseries.**)
*Dtsch. Baumsch.*, 1954, **6**: 177-99, illus.
With variety descriptions.

l LAMB, I. M.
**New, rare or interesting lichens from the southern hemisphere II.**
*Lilloa*, 1953, **26**: 401-38, bibl. 4, illus.

m LEE, R. E.
**The culture of gladiolus.**
*Cornell Ext. Bull.* **914,** 1954, pp. 4.

n LEWIS, H., AND EPLING, C.
**A taxonomic study of Californian delphiniums.**
*Brittonia*, 1954, **8**: 1-22, bibl. 4, illus.
9 species plus sub-species described.

o LIPP, L. F.
**New methods in plant propagation.**
*Gdn J. N.Y. bot. Gdn*, 1954, **4**: 70-1.
See also *H.A.*, 23: 3305 and 24: 2925.

p LÖHR, E.
Sukkulenternes fysiologi. (**The physiology of succulents.**)
*Nat. Verd., Kbh.*, 1954, **38**: 102-14, bibl. 9, illus.
Dealing with several cultivated species.

q McKENZIE, H. L.
**Two new *Selenaspidus* scales infesting *Euphorbia* in California. Scale studies—Part XII.**
*Bull. Calif. Dep. Agric.*, 1953, **42**: 53-8, illus.
*S. albus* and *S. rubidus* on *Euphorbia* nursery stock.

r MARSHALL, L. M.
**Controlling algae on flower pots.**
*Comm. Gr*, 1954, No. 3056, p. 168.
For a more detailed account see *H.A.*, 24: 624.

s NEISWANDER, R. B.
**The control of mites on shade and ornamental trees.**
*Proc. nat. Shade Tree Conf. 1953*, pp. 114-17.

t NICHOLS, L. P.
**Diseases of ornamental shrubs and vines.**
*Circ. Pa agric. Ext. Serv.* **429,** 1954, pp. 24, illus.
Causal agents, symptoms, and control in Pennsylvania.

u NILSSON, A.
*Chrysanthemum carinatum* Schousb. und *coronarium* L., ihre Bastardformen, Geschichte und Variation. (***Chrysanthemum carinatum* and *C. coronarium,* their hybrids, history and variation.**)
*Agri hort. Genet.*, 1954, **12**: 65-106, bibl. 53, illus.

v VAN ONSEM, J. G.
L'éclairage artificiel dans la culture d'Aechmea. (**The possibilities of artificial light for growing *Aechmea.***)
*Rev. Agric. Brux.*, 1954, **7**: 568-73, illus.
*Aechmea fasciata.*

w POST, K., AND FISCHER, C. W., Jr.
**U.S. experiments on cold storage of flowers.**
*Grower*, 1954, **42**: 291-4, illus.
For abstract of very similar paper see *H.A.*, 23: 983.

x PURI, B., AND SESHADRI, T. R.
**Survey of anthoxanthins: Part IV—Chromatographic study of yellow garden flowers and constitution of coreopsin.**
*J. sci. industr. Res., India*, 1954, **13B**: 321-5, bibl. 15.
Using *Cosmos sulphureus*, *Coreopsis* spp. and *Dahlia.*

y REARK, J. B.
**Cultivation of the genus *Alocasia* in Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 326-31, illus.
A description of 14 species and their culture.

z RIBALDI, M.
Su un deperimento di *Robinia pseudoacacia* L. var. *umbraculifera* DC. f. *bessoniana* Cowel, dovuto a *Phomopsis oncostoma* (Thüm.) v. Höhnel. (**On a dieback of *Robinia pseudo-acacia* var. *umbraculifera* f. *bessoniana* due to *Phomopsis oncostoma.***) [English summary ½ p.]
*Ann. Sper. agrar.*, 1954, **8**: 1197-1212, bibl. 30.
Recorded for the first time in Italy.

4163.

a ROTH, I.
Entwicklung und histogenetischer Vergleich der Nektar- und Verdauungsdrusen von *Nepenthes.* (**Development and histogenesis of the nectar and digestive glands of *Nepenthes.***)
*Planta*, 1954, **43**: 361-78, bibl. 14, illus.

b VAN SLOGTEREN, E.
Door nog betere kwaliteit van onze tulpenbloemen naar een grotere export. (**Better flower quality in tulips can lead to bigger exports.**)
[*Publ.*] *Lab. Bloemboll. Lisse* **93,** 1952, pp. 11, illus.

c SPICKETT, R. G. W., AND SQUIRES, J. A.
***Robinia pseudoacacia* seeds from Cyprus.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 57-9.
Analysis suggests possible value for stock feed but not oil.

d STOUGHTON, R. H., AND VINCE, D.
**Possible application of photoperiodism in plants.**
*World Crops*, 1954, **6**: 311-13, illus.
To control flowering dates.

e TANDON, S. L., AND VASIL, I. K.
**A spontaneously occurring variegated chimera in *Bougainvillea spectabilis* Willd.**
*Indian J. Hort.*, 1954, **11**: 10-12, bibl. 3, illus.

f TEPE, W.
Physikalische und chemische Untersuchungen an gärtnerischen Kulturerden. **(Physical and chemical studies on soils for pot plants.)**
*Z. PflErnähr. Düng.*, 1953, **63**: 222-35, bibl. 11.

g VEKSTHUSFORSØKSFONDETS KOMITÉ FOR PRØVEDYRKING AV CHRYSANTHEMUM.
Prøvedyrking av Chrysanthemum 1952 og 53. **(Chrysanthemum variety trials 1952-53.)**
*Gartneryrket*, 1954, **44**: 232-3.

h VENKATESH, C. S.
**Resupination of flowers in *Cassia fistula*.**
*Sci. and Cult.*, 1954, **19**: 610-11, bibl. 1.

i WASSCHER, J.
Enige aspecten van het tuinbouwonderwijs, in he tbijzonder in het bloementeeltcentrum Aalsmeer. **(Some aspects of horticultural education, particularly at the floricultural centre of Aalsmeer.)** [English summary 5 lines.]
*Meded. Dir. Tuinb.*, 1954, **17**: 485-98, illus.
Horticultural training in Holland.

j WHITING, A.
**Iris hybridizing.**
*Nat. hort. Mag.*, 1954, **33**: 89-92, illus.
Results of 20 years' hybridizing outlined.

k WULFF, H. D.
Cytologische Untersuchungen an einem pentaploiden Rosenbastard (*Rosa* hybr. "315") und seiner Nachkommenschaft. **(Cytological studies of a pentaploid rose hybrid (*Rosa* hybr. "315") and its progeny.)**
*Planta*, 1954, **43**: 420-39, bibl. 23, illus.

l ZAITLIN, M., AND OTHERS.
**Detection of virus in *Cattleya* orchids by serological methods.**
*Phytopathology*, 1954, **44**: 314-18, bibl. 16.

m ZUBERBÜHLER, —.
*Primula malacoides* "Ämtler Perle" und "Charme" unter internationalem Namens- und Markenschutz. **(International protection for the *Primula malacoides* varieties Ämtler Perle and Charme.)**
*Schweiz. Gärtnerztg*, 1954, **57** (19): 2-3, illus.
Two new varieties described.

## SUB-TROPICAL FRUIT AND PLANTATION CROPS.

### *Avocadoes.*

(*See also* 3639, 4264k, l, o, 4453.)

4164. HALMA, F. F.
**Avocado rootstock experiments. A 10-year report.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 79-86, bibl. 9.

Avocado rootstock experiments and related problems are discussed. Fifty-three field plots, averaging more than 100 trees each, have been established during the period between 1943 and 1953. Two-thirds of the plots are now in satisfactory condition; the rest are doubtful or have been lost. Thirty-seven rootstock varieties and five scion varieties are included. The most valuable information so far obtained is that Guatemalan varieties are, or seem to be, more susceptible to chlorosis, *Verticillium* wilt and *Dothiorella* canker than Mexican varieties. [Author's summary.]

4165. GILLESPIE, H. L.
**Development and evaluation of clonal rootstocks in the avocado. Phase two.**
*Yearb. Calif. Avoc. Soc., 1953/54*, 1954, **38**: 87-95, bibl. 10, illus.

Following a general discussion of the need for clonal rootstocks the author describes a method whereby clonal material was obtained from seedling rootstocks carrying exceptionally high yielding Fuerte scions. Root cuttings taken from these stocks were whip-grafted on to the stubs of the tap roots of seedlings and regeneration took place in a hotbed. Observations on one of these clones, designated Casper No. 2, suggest that the vigour of the seedling was not affected by the portion of clonal root and that similarly when Fuerte scions were top-worked on the seedlings their growth rate reflected the vigour of the seedling interstocks rather than that of the root clone. By contrast, when Fuerte scions were grafted into re-grown tissue below the union of seedling and root clone their subsequent growth was expressive of the original Casper No. 2/Fuerte tree.

4166. GALLATIN, M. H.
**Fertilizer, irrigation studies on avocados and limes on the Rockdale soils of the Homestead area.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 228-30.

Irrigation trials in lime and avocado groves over 2 years emphasized the importance of giving water when needed and not according to a fixed cycle. Fertilizer trials showed that N supplied in a readily available form was too easily leached for use in irrigated groves. Maximum benefit from organic manures was only obtained when an adequate moisture level was maintained.

4167. HAAS, A. R. C., AND BRUSCA, J. N.
**Biuret, toxic form of nitrogen.**
*Calif. Agric.*, 1954, **8** (6): 7, 11, illus.
**Biuret, a form of nitrogen toxic to citrus and avocado leaves.**
*Citrus Leaves*, 1954, **34** (6): 11-12, illus.

The toxicity of biuret, a compound form of nitrogen obtained from urea, was tested on cuttings of Prior Lisbon lemons and Zutano avocado, and on seedlings of Hass avocado. The cuttings were grown in sand cultures and received Hoagland's nutrient solution to which biuret was added at concentrations of 0, 50, 100 or 150 p.p.m. A few days later immature leaves showed signs of injury by marginal wilting followed by chlorosis; symptoms in mature leaves appeared more slowly. The toxic effects of biuret on avocado seedlings grown in soil cultures was also very marked.

4168. North, C. P., and Wallace, A.
**Tolerance of open-pollinated Dickinson avocado seedlings to lime soil.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 198-202, bibl. 4, illus.

The split-seed technique was used experimentally to compare growth of Dickinson (Guatemalan) avocado seedlings in lime and non-lime soil. Thirty pairs of seedlings, each pair genetically identical, have been grown for eleven months with one of each in lime soil and the other one in non-lime soil. Half of the plants in lime soil were in soil artificially limed with calcium carbonate to 5% by dry weight of soil. The remainder of the lime soil was from four different avocado groves where chlorosis existed. Genetic variability existed in the susceptibility of the seedlings to lime-induced chlorosis. About one-third of the seedlings in artificially limed soil were severely stunted and another third were slightly stunted relative to the non-lime soil. There was far less detrimental effect for the natural lime soils used than for artificially limed soil. Several of the seedlings grew just as well in lime as in non-lime soil. All of them in non-lime soil were as large as or larger than those in lime soil. [Authors' summary.]

4169. Haas, A. R. C., and Brusca, J. N.
**Total sulphur content and its effect on avocado leaves.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 171-6, illus.

By means of sand and soil cultures, it was shown that excessive concentrations of total sulphur in avocado leaves resulted in a loss of green colour and severe marginal leaf burn. The leaf content of magnesium tended to increase to varying degrees, as the concentration of calcium sulphate in the nutrient solution or soil mixture increased the content of calcium and total sulphur in the leaves. Leaves affected by excessive total sulphur (determined as total $SO_4$) accumulation are frequently found in orchard trees where the additional effects of other injurious elements such as sodium and chlorine intensity further the leaf damage. The elimination of sulphur-containing materials as far as possible from an avocado orchard, unless nutritional sulphur-deficiency or a high pH occurs, should benefit avocado tree response. [From authors' summary.]

4170. Haas, A. R. C., and Brusca, J. N.
**2,4-D treatment of avocado plants.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 165-70, illus.

The growth of rooted leafy-twig cuttings of the Zutano (Mex.) avocado variety was greatly stimulated by the addition, on only three occasions, of very low concentrations of 2,4-D to the nutrient solution applied to the soil of glasshouse cultures. The growth of large outdoor soil cultures of Carr Fuerte avocado trees budded on Caliente (Mex.) avocado rootstocks was greatly stimulated by the addition, on only three occasions, of 0·005, 0·010, or 0·015 p.p.m. of the acid form of 2,4-D to the nutrient solution applied to the soil. The concentration of plant growth regulators in soils appears to bear some relation to the fertility of the soil. A beginning has been made in the direct reconstituting of desirable highly productive avocado trees by the cleft-grafting of a leafy twig cutting into a piece of avocado root. Low concentrations of 2,4-D and of nutrient solutions, the use of plaster sand-peat mixture, continuous water vapour in the propagation chamber, reduced light intensity, bottom heat, and a good drainage are some of the factors being tested. [From authors' summary.]

4171. Schroeder, C. A.
**Some aspects of pollination in the avocado.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 159-62, bibl. 7, illus.

The results of studies on avocado pollen and its behaviour are outlined. The pollen has proved difficult to germinate on artificial media, although it grows readily on avocado stigmas. All varieties of avocado appear to produce sufficient pollen for adequate fruit set, some varieties producing more than 10,000 grains per flower. Pollination appears to be effected by such insects as bees, but the set of caged flowers suggests that it can also be effected by mechanical contact between anthers and stigmas. Examination of flowers in various areas has shown the presence of germinating pollen grains in such quantities as to suggest that germination is probably not a limiting factor in fruit set. It would appear that the rate of pollen tube growth may vary with variety, but further work on this aspect and on the effects of environmental factors will be necessary before conclusions can be drawn. Similarly, work on the development of the embryo and on factors which may cause abortion is in a preliminary phase.

4172. Schroeder, C. A.
**Abnormal fruit types in the avocado.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 121-4, bibl. 4, illus.

Among the various forms of abnormality described and illustrated are double fruits, distortions of various types, woody fruits and sectorial chimaeras. Causes, where known, are indicated.

4173. Halma, F. F., and Zentmyer, G. A.
**Relative susceptibility of Guatemalan and Mexican avocado varieties to dothiorella canker.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 156-8, bibl. 1, illus.

Recent observations have shown that trunk cankers due to *Dothiorella gregaria* (*Botryosphaeria ribis*) may become serious in trees in which either the rootstock or scion or both are of the Guatemalan race. Mexican varieties, though infected when inoculated artificially, appear to be less susceptible. [See also *H.A.*, 24: 1817.]

4174. Zentmyer, G. A., and Schroeder, C. A.
**Tests of *Persea* species for resistance to *Phytophthora cinnamomi*.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 163-4.

The results of tests are tabulated for one or more varieties of 10 species of *Persea*. Of these only *P.*

*borbonia* and *P. skutchii* have shown appreciable resistance to *Phytophthora cinnamomi.*

4175. Halma, F. F., Zentmyer, G. A., and Wilhelm, S.
**Susceptibility of avocado rootstocks to verticillium wilt.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 153-5, bibl. 4, and *Citrus Leaves*, 1954, **34** (8): 14, 31, bibl. 4.

Verticillium wilt of avocado, due to *V. albo-atrum*, has been recognized as such since 1948. The results of field observations, seedling inoculation tests and rootstock identification tests on naturally infected trees all indicate that although both Guatemalan and Mexican rootstocks can be affected by verticillium wilt the former are the more susceptible.

4176. Delphey, C. C.
**Fuller rose beetle is serious pest of avocados.**
*Citrus Leaves*, 1954, **34** (8): 9.

DDT dust as 5% to 10% has given good control of this beetle, *Pantomorus godmani.*

4177. Haas, A. R. C., and Brusca, J. N.
**Inorganic content of portions of avocado fruit of several varieties grown under various orchard conditions.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 177-88, illus.

Avocado fruits of several varieties were collected from healthy trees and from trees growing in saline areas, and different portions of the fruits analysed for Ca, Mg, K, Na, Cl and S. In some cases leaves were also analysed. The results, which should be regarded as preliminary, suggest that shortages of such elements as Ca and Mg in the leaves result in the production of small sized fruits. When excessive concentrations of such elements as Cl, S or Na occur they tend to accumulate in the fruit stalk, button and peel, with, in many cases, little or no accumulation taking place in the pulp or seed. Pulp from the stem and tip ends of the fruit showed considerable differences in composition, but, apart from K which was higher in the tip end, these differences were not consistent. Evidence is also presented that leaves can make good transpiration losses by withdrawing water from the fruits.

4178. Haas, A. R. C., and Brusca, J. N.
**Some inorganic changes in the pulp of mature Fuerte avocado fruit.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 189-97, bibl. 1.

Samples of Fuerte avocado fruits were collected on 6 dates between 10 November and 1 May, kept until soft enough to be edible and their pulp then analysed. With the advance of the season fresh weights and sizes of the mature fruits increased, and percentages of K, Mg and Ca in the dry matter of the pulp decreased, due possibly to dilution resulting from the increase in organic matter content. Both Ca and Mg contents tended to be lower in the pulp of the tip end of the fruit than in the stem end, whereas K, which was present in large quantities, was highest in the tip end. Increasing Cl accumulation occurred during the season in the fruit stalk.

### *Carobs.*

4179. da Matta, G. J.
A alfarrobeira em Portugal. Sua cultura e comércio. **(The carob tree in Portugal. Culture and trade.)** [English and French summaries 14 and 16 lines.]
*Bol. Junta nac. Frutas*, 1952, **12**: 18-56, illus.

An account is given of the culture of *Ceratonia siliqua* in the Algarve province and of home and foreign trade. The cultural notes cover climate, soil, propagation by seed, cuttings, suckers and grafting, cultural practices, manuring, harvesting, storage and varieties. Mulata is said to be the best of the dioecious varieties.

4180. Russo, F.
Aspetti biologici e colturali del carrubo in Sicilia. **(Biological and cultural notes on the carob in Sicily.)** [English summary ½ p.]
*Ann. Sper. agrar.*, 1954, **8**: 948-67, bibl. 22, illus.

The Italian production of carob pods (*Ceratonia siliqua*) averages 450,000 quintals per annum, of which nearly 80% comes from Sicily. The chief male, female and hermaphrodite varieties cultivated in Sicily are described. Adequate pollination does not always occur and the possibility of using hermaphrodite instead of male pollinators is being studied. Preliminary investigations suggest that artificial pollination gives better fruit set than open pollination and that the variety Ermaphrodita Tantillo, which has good quality fruit and high yield, is as good a pollinator as the male varieties.—Staz. sper. Fruttic. Agrumic., Acireale.

### *Citrus—general.*

(*See also* 3518, 4264n, p, 4265c, f, 4464, 4476, 4477, 4482, 4487.)

4181. Israel Ministry of Commerce and Industry and others.
**Citrus industry in Israel.**
*Economic News*, 1954, **6** (1/2): 4-132, bibls., illus.

This whole number of *Economic News* is devoted to the citrus industry in Israel, different aspects of which are discussed in the following articles:

Rokach, Y., Hundred years of citrus growing in Palestine, pp. 7-17.
Ophen, I. D., The area under citrus cultivation, pp. 18-24, bibl. 6.
Gourstein, B., The development of citrus planting and cultivation methods, pp. 25-9.
Levie, E. L., Production costs, profits and losses in citrus groves, pp. 30-46, 132.
Ophen, I. D., Centralized packing of our citrus fruit, pp. 47-54, bibl. 7.
Chorin, Y., The citrus indistry as a pillar of Israel's economy, pp. 55-7.
Ophen, I. D., World production of citrus fruit, pp. 58-62.
Arnon, A. S., Shipment and marketing of Israel's citrus fruit, pp. 63-8.
Levie, E. L., Optimal area and marketing, pp. 69-75.
Ophen, I. D., The fruit inspection service, pp. 76-83, bibl. 5.

Liwni, M., The finance problems of the citrus indistry, pp. 84-93.

Bejarno, M., Israel's citrus products industry, pp. 94-100.

The series of articles concludes with reports by 3 firms engaged in citrus processing and with short notes on citrus planting in workers' settlements and on the Israeli citrus transport fleet. Statistics of citrus production and marketing and of the citrus products industry are among the information presented in appendices.

4182. Burke, J. H.
**Citrus markets and marketing in Western Europe 1953.**
*Foreign Agric. Rep.* **79**, 1954, pp. 71, illus.

Western Europe offers an expanding market for U.S. fresh and processed citrus fruit, partly owing to the improved financial circumstances of many workers, but the U.S. will also have to meet growing competition. Notes are given on the supply, demand and marketing of citrus fruit and products in Western Europe in 1953.

### *Citrus—varieties, rootstocks and propagation.*

(*See also* 4264f, 4269.)

4183. Crescimanno, F. G.
Il mandarino "Tardivo di Ciaculli". (**The mandarin Tardivo di Ciaculli.**) [English and French summaries 10 lines each.]
*Riv. Ortoflorofruttic. ital.*, 1954, **38**: 181-8, illus.

Notes are given on the Tardivo di Ciaculli, a high-quality, late variety of mandarin cultivated mainly in the Ciaculli district of Sicily. It is probably a bud mutant of Avana di Palermo, the most widely grown variety in the island which matures in November/January. Tardivo di Ciaculli gives better quality fruit than the latter and matures in February/March.

4184. Hu, C. C.
**A review of citrus rootstock studies.**
*Mem. Coll. Agric. nat. Taiwan Univ.*, 1953, **3** (2): 16-39, bibl. 18, illus.

Citrus rootstocks, their identification, native habitat and distribution, characters, propagation, grafting affinity, and effects are discussed in a study made by the author at the Citrus Experiment Station, University of California.

4185. Selle, R. M.
**Determination of sour orange rootstock by paper chromatography.**
*Nature*, 1954, **174**: 140-1, bibl. 2, illus.

In view of the susceptibility of sour orange to quick decline it is of importance to determine which trees in established citrus orchards have been worked on this rootstock. The following method is described for identifying sour orange with the aid of paper chromatography: The sap is extracted from the bark of the root and treated with a solvent consisting of the organic phase of a mixture of 4 parts normal butanol, 1 part of glacial acetic acid, and 5 parts of water. Under a long-wave ultra-violet lamp (3600 Å.) the ninhydrin-sprayed chromatograms show a yellowish fluorescent, "flame-like" spot with an $R_F$ value of approximately 0·50. No other citrus rootstock examined gave this "flame reaction".—Occidental College, Los Angeles, Calif. [For another account see *H.A.*, 24: 1826.]

4186. Ford, H. W.
**Rootstock and tree age influence root development on sandy soils.**
*Citrus Mag.*, 1954, **16** (9): 8-10, bibl. 3, illus.

A detailed study was made of feeder roots of orange and grapefruit trees on rough lemon, sour and sweet orange, Cleopatra mandarin and grapefruit rootstocks, growing in a well-drained sandy soil in Florida. Five-year-old trees on rough lemon were found to have roots penetrating to 8 or 9 ft., with 46% of the feeder roots in the top 10 inches of soil; 20- to 30-year-old trees had roots penetrating to 14–17 ft., with 50% of the feeder roots more than 30 inches below the surface. Roots of sour orange, of 20- to 25-year-old trees penetrated to 11–14 ft., but in contrast to rough lemon there were more feeder roots in the top 10 inches of soil, and fewer in the 30 to 60 inches zone. Trees on sweet orange, up to 18 years old, showed a greater feeder root concentration to a depth of 5 ft. than those on any other rootstock studied. Cleopatra mandarin showed considerable root development in the 30 to 60 inches zone; the scion variety was also important, as Valencia oranges on Cleopatra were shallower rooted at 13 years than Temples on Cleopatra. Grapefruit rootstocks showed very shallow rooting, penetration at 33 years being only 8 feet.

4187. Singh, K. K.
**Rootstock effect on the fruit quality of Malta orange (*Citrus sinensis* Osbeck).**
*Indian J. agric. Sci.*, 1954, **24**: 1-22, bibl. 28, illus.

Studies were made on the quality of fruit of Malta Common and Malta Blood Red oranges grown on different rootstocks. The development of the red colour in Malta Blood Red was markedly influenced by the rootstock used, *Citrus karna* having the greatest intensifying effect. In both varieties fruit size and peel content were influenced by rootstock type, citron and sweet lime producing the largest but lowest quality fruits. The percentages of juice, sugars and acidity were higher in Malta Common on rough lemon and Nasuaran rootstocks, and in Malta Blood Red on rough lemon and *C. karna.* Nasuaran, rough lemon and *C. karna* produced the best quality fruits in Malta Common, and rough lemon in Malta Blood Red.

4188. Orillos, M. O.
**The effects of different methods of budding citrus on the development of the scion.**
*Araneta J. Agric.*, 1954, **1** (2): 27-45, bibl. 6, illus.

Mandarin and pumelo were budded on mandarin in trials in 1952/53 in which 6 budding methods were compared. The direct Surinam Bending method gave the best scion growth followed by the Direct Bending method. Growth data, diagrams and short descriptions of the budding methods are given.

4189. Blondel, L.
Influence de la hauteur du point de greffe sur le comportement des agrumes gréffes sur *Poncirus trifoliata.* (**The influence of the height of grafting on the behaviour of citrus grafted on trifoliata.**)
*Ann. Inst. agric. Algér.*, 1953, **7** (8): 1-12, bibl. 5, illus.

Studies were made in Algeria on a 12-year-old orchard of Clementines grafted on trifoliate orange, to evaluate the influence of the height at which grafting was done. Trees grafted at less than 10 cm. above ground level had ridged trunks, rarely showing exocortis symptoms, grew vigorously and gave an average yield, over 4 years, of 25 kg. per tree. Trees grafted at a height of more than 30 cm. had smooth trunks, with much exocortis, stunted growth and an average yield over 4 years of 13 kg. fruit per tree. Trees grafted at intermediate heights gave intermediate results.

### *Citrus—cultivation and irrigation.*

(*See also* 4264e, v.)

4190. Renaud, M.
L'entretien du sol de l'orangeriae. (**Soil management in the citrus plantation.**)
*Fruit et Prim.*, 1954, **24**: 211-14, bibl. 8.

The *pros* and *cons* and techniques are discussed of tillage with or without a winter green manure, the Hinckley system of non-tillage and no vegetation cover (destroyed by herbicide), and non-tillage with permanent cover. Recommendations for Morocco are (1) avoidance of deep cultivation especially in spring, (2) avoidance of too frequent and too vigorous breaking up of the soil which results in a plough pan, (3) non-tillage with permanent cover in the rainy coastal areas especially on shallow soils, and (4) non-tillage and no cover in dry climates.

4191. Huberty, M. R., and Richards, S. J.
**Irrigation experiments with navel oranges at Riverside.**
*Citrus Leaves*, 1954, **34** (8): 6-7.

A preliminary report is given of a long-term furrow irrigation experiment on Washington Navel oranges on sour and sweet orange rootstocks carried on since 1934. Frequent irrigation (a 3-week schedule) gave a highly significant yield increase over infrequent irrigation. Relatively large applications intended to wet 80% of the tree root zone did not result in increased yields when compared with 40% applications under the conditions of this experiment. No significant difference between the effects on sweet and sour rootstocks was finally apparent. Annual trunk size measurements, used as an index of growth, showed only slightly larger growth for frequently irrigated trees.

### *Citrus—tree composition and nutrition.*

(*See also* 4166, 4167, 4220, 4221, 4264z, 4453.)

4192. Cuenot, G.
Rapport sur la fumure des oranges. (**Report on the manuring of oranges.**)
*Fruits et Prim.*, 1954, **24**: 103-18.

A preliminary report is given after 3 years' experiments with 12-year-old Washington Navel oranges on sour orange, growing in the Sidi Slimane region of Morocco. N, P, and K were applied in different combinations and doses, and the effects noted on vegetative growth and production, annual yield variation, fruit size, juice composition, and the balance between N, P, K, Ca and Mg in the leaves at the time of harvest. Results showed that N increased the yield and acidity of the fruits, but this latter characteristic was corrected by P and K. Low leaf N and high leaf K were associated with low yields, but high leaf Ca with high yields; Mg seemed to bear no relation to fruiting. The most promising fertilizer mixture used was 1 kg. N, 250 g. $P_2O_5$ and 300 g. $K_2O$ per tree.

4193. Sites, J. W., Wander, I. W., and Deszyck, E. J.
**The effect of fertilizer timing and rate of application on fruit quality and production of Hamlin oranges.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 54-62, bibl. 5.

The results of a timing and rate of application of fertilizer experiment are presented [for several years]. Timing periods included spring-summer-fall, spring-summer, spring-fall, and summer-fall. Rates of application were designated as a, b, c and d and represented the amount of mixed fertilizer containing 0·15, 0·20, 0·30 and 0·40 lb. of nitrogen per box of anticipated yield with other elements [P, K, Mn, Mg and Cu] in proportion. Significant increases in production were found to result from the spring-summer timing period. The highest yielding trees in the rate experiment received the rate "c" treatment. When rates of fertilizer above and below this amount were applied the yields decreased. There was little or no correlation between soil or leaf analyses and the yield data. Fruit quality as determined by juice analysis was not significantly changed by any of the fertilizer timing or rate experiments, although there was a trend toward higher quality from spring-fall applications. Authors' summary.]

4194. Wallace, A.
**Ammonium and nitrate nitrogen absorption by citrus.**
*Soil Sci.*, 1954, **78**: 89-94, bibl. 7.

This investigation reported from California is primarily concerned with the absorption of ammonium and nitrate sources of N by citrus, namely Eureka lemon and Valencia orange cuttings. Such cuttings have coarse feeder roots and no root hairs. Absorption of N from $N^{15}H_4NO_3$ and from single N sources was studied. $NO_3$-N was 2 to 5 times as readily absorbed from soil as was $NH_4$-N. Most of the non-absorbed $NH_4$-N was not fixed against extraction with 1 *N* NaCl. Exchangeable $NH_4$-N was then less available than was $NO_3$-N. From sand and solution, both sources were absorbed at nearly the same rate. Total N absorption from $NH_4NO_3$ increased, but the efficiency of N decreased, with increasing rate of N application in potted soil. For the $NH_4$ portion of the fertilizer alone, the efficiency of absorption did not seem related to the rate of application. In order of increasing application rate, 22%, 29% and 52% of the applied N remained in the soil as $NO_3$-N and N extractable with 1 *N* NaCl after a 59-day growing period of lemon cuttings. More remained as $NH_4$ than as $NO_3$. The total recovery of both N sources amounted to 72%, 57% and 39%, respectively. That fixed in organic matter and as non-exchangeable $NH_4$ was 10%, 8% and 7%, respectively, of the total N added. There was very little evidence of N loss from the soil treatments.

4195. McCollam, M. E., and Fullmer, F. S.
**Surveying California citrus with leaf analysis.**
*Bett. Crops*, 1954, **38** (6): 19-22, 40-1, bibl. 4.

Examination of data from a number of leaf analysis surveys shows that in the case of oranges P leaf levels below 0·10% and K leaf levels below 0·60% indicate deficiency, and of the groves sampled about 18% and 35% respectively fell within these zones of possible deficiencies. In the case of lemons P contents of 0·08% or below and K contents of 0·50% or below indicate a need for appropriate fertilizer applications.

4196. Garayar M., H.
Elementos menores en árboles cítricos. (**Minor element deficiencies in citrus.**)
*La Hacienda*, 1954, **49** (4): 70, from abstr. in *Bol. Inf. Colombia*, 1954, **5** (53): 5.

In experiments at Tingo Maria citrus station Cu, Zn and Mn deficiencies were corrected by foliage sprays of salts of these elements and B deficiency by soil application of boric acid at 1 g. per sq. m. Control was also obtained by solid injection of the trunks.

4197. Haas, A. R. C., and Brusca, J. N.
**Valencia orange fruit size.**
*Calif. Agric.*, 1954, **8** (7): 13-14, illus.

Valencia orange trees on sour orange growing in sand culture received a nutrient solution of pH 4·4 but with varied levels of calcium and magnesium. Results after 3½ years showed that the largest fruits were obtained from trees receiving solutions containing 61 p.p.m. Ca with 157 p.p.m. Mg, and 82 p.p.m. Ca with 144 p.p.m. Mg. There was an improvement in root systems as Ca in the nutrient solution was increased; very low Ca or Mg values had a depressing effect on fruit size and root condition. Fruits from low Ca and high Mg had the highest percentages of peel; a decrease in Mg and increase in Ca was accompanied by an increase in the fresh weights of fruit pulp.

4198. Smith, P. F., and Specht, A. W.
**Mineral composition of Valencia orange seedlings grown in solution with varying amounts of copper, zinc, manganese, and iron.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 85-9, bibl. 5.

Valencia orange seedlings were grown in solution culture with excessive quantities of copper, manganese and zinc, which had earlier shown toxic effects on citrus [*H.A.*, 23: 3436]. Copper, the most toxic, occurred in the lowest concentrations in the plant; manganese, the least toxic, showed the highest concentrations in plant parts. Large excesses of all 3 metals lowered the absorption of the base elements. All 3 metals lowered the iron concentration in the tops, but not in the roots. Adequate chelated iron maintained a normal supply of iron in the foliage. [See also *H.A.*, 24: 774, 1838.]

4199. Reitz, H. J., and Shimp, N. F.
**Copper oxide as a soil amendment for citrus.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 37-42, bibl 9.

The relative availability and toxicity of copper supplied as the oxide or sulphate to citrus seedlings in pots containing 3 mineral soils was studied. Soil copper levels ranged from less than 5 p.p.m. to 1,000 p.p.m. With virgin soils, Cu additions of 9·5 or 10 p.p.m. slightly increased seedling growth and increased the Cu content of leaves significantly. In general at high Cu levels, the oxide and sulphate forms were about equally toxic. Cleopatra mandarin showed iron chlorosis more commonly than did sour orange, and accumulated less Cu in the leaves than did sour orange and rough lemon. As a result of these experiments copper oxide is tentatively recommended as a soil amendment for citrus in Cu-deficient groves.—Fla Citrus Exp. Stat., Lake Alfred.

4200. Reuther, W., Smith, P. F., and Scudder, G. K., Jr.
**Relation of pH and soil type to toxicity of copper to citrus seedlings.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 73-80, bibl. 7, illus.

A series of pot studies with seedlings of sweet orange and Cleopatra mandarin were designed to clarify further the relation of type, cultural history, and acidity of 4 Florida soils to toxicity of copper in the soil. A very sandy Lakeland-type soil became toxic to citrus seedlings at a much lower level of total copper than did a better Orlando-type soil of higher exchange capacity and organic matter content. Heavy liming of Lakeland sand to produce a neutral to alkaline reaction (pH 7 or above) greatly reduced the toxicity of added copper as compared with treatments in the acid range (pH 6 to 4). An old grove soil, compared with an analogous virgin soil, contained some factors which reduced the toxicity of added copper to citrus seedlings, yet increased the prevalence of iron chlorosis symptoms in their leaves. Citrus seedlings growing in the virgin Lakeland and Orlando top-soils did not develop appreciable iron chlorosis of the foliage throughout a wide range of copper and pH treatment combinations. An over-all yellowing of the foliage suggesting N starvation was associated with the stunting of top growth and fibrous root development caused by additions of toxic amounts of copper to the soil.—U.S. hort. Stat., Orlando.

4201. Leonard, C. D., and Stewart, I.
**Chelated iron as a corrective for lime-induced chlorosis in citrus.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 49-54, bibl. 10.

The iron chelate of hydroxyethyl ethylenediamine triacetic acid (Fe-EDTA-OH) was found to be considerably more effective than the iron chelate of ethylenediamine tetraacetic acid (Fe-EDTA) in correcting iron chlorosis in citrus growing on calcareous soils. Fe-EDTA-OH, applied at 25 to 100 g. of iron per tree, induced excellent recovery from lime-induced chlorosis within 3 to 4 months. About 300 g. of iron per tree in the form of Fe-EDTA was needed for complete recovery from chlorosis. Field experiments using Fe-EDTA with an acidifying material were carried out to discover whether this combination would correct lime-induced chlorosis on soils where Fe-EDTA-OH was not effective. It was found that the application of 4·5 lb. technical grade of sulphuric acid, either broadcast or in holes dug beneath the trees, followed by relatively small applications of iron as Fe-EDTA, gave good greening of chlorotic trees on calcareous soils.—Fla Citrus Exp. Stat., Lake Alfred.

4202. FORD, H. W.
**Root distribution of chlorotic and iron-chelate-treated citrus trees.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 22-6, bibl. 5.

Soil applications of iron chelated with EDTA (ethylenediamine tetraacetic acid) to iron-deficient orange trees on rough lemon, resulted in a significant increase in feeder roots. In cultivated groves, however, feeder roots remained absent to a depth of 10 inches even when chelated iron had been applied. In uncultivated groves the chelated iron treatment resulted in an increase in feeder roots particularly in the top 3 inches of soil Changes in soil pH influenced the distribution of feeder roots throughout the entire root profile.—Fla Citrus Exp. Stat., Lake Alfred.

4203. KAUDY, J. C., AND OTHERS.
**Fluorine content of citrus leaves in California orchards.**
*Citrus Leaves*, 1954, **34** (6): 8-10.

This article is mainly a reprint of one previously noticed [see *H.A.*, 24: 3068], but here in addition the leaf sampling technique used is fully described.

4204. HAAS, A. R. C., AND BRUSCA, J. N.
**Sodium effects in citrus seedlings.**
*Citrus Leaves*, 1954, **34** (8): 12-13, illus.

Experiments were carried out with citrus rootstock seedlings in soil culture to note the effects of sodium applied in nutrient solution. An adaptation of Hoagland's nutrient solution was used, and to it 6 levels of sodium nitrate were added. The seedlings showed much growth variation, but a general tendency towards increased growth with increased Na was observed, except with sweet orange, grapefruit and trifoliate orange which showed some decline in growth at high Na levels. Sodium values were generally low and not uniform in the seedling leaves, and bore no relationship to the concentration of Na added to the soil. With sweet orange and tangelo seedlings the leaves showed generally decreasing K percentages as the concentration of sodium nitrate was increased. The Na content of the roots increased with the concentration of sodium nitrate in the nutrient, sweet orange containing the highest percentage and citrange the lowest.

### *Citrus—growth phenomena, fruit set and fruit drop.*

(*See also* 4264a.)

4205. VINOKUR, R. L.
**The growth of ringed lemon shoots under the influence of roots receiving no mineral nutrients.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1953, **93**: 357-9, illus.

In the experiment described ringing the shoots of young lemon seedlings retarded growth. When root formation was induced on the cut edge above the ring by heteroauxin, applied at 300 mg. in 1 litre water for 16 hours, and the rootlets allowed to grow in darkened, suspended test tubes filled with water only, growth was renewed. The rooted plants overwintered indoors under controlled conditions retained their leaves, while the ringed control plants without aerial roots shed all their leaves.

4206. BALLOT, R., AND PRALORAN, J. C.
Rapport sur la chute des jeunes fruits des agrumes. (**Report on the drop of young citrus fruits.**)
*Fruits et Prim.*, 1954, **24**: 119-24, bibl. 7.

Between 1948 and 1952 records of temperature, rainfall and wind were kept and examined in relation to the drop of young fruits from 3 orange varieties in Morocco. No significant climatological relation was apparent, and the author concludes that the phenomenon is a physiological one, whereby the tree corrects its surplus flower production.

4207. RENAUD, M.
Essai sur la chute des agrumes en rapport avec la floraison. (**Fruit drop in relation to flowering in citrus.**)
*Fruits et Prim.*, 1954, **24**: 199-210, bibl. in text, illus.

Citrus yields are often reduced by flower drop and young fruit drop, the heaviest drop occurring in the trees with the most abundant flowers and fruit. Present knowledge on this subject is reviewed under the headings: flowering, fruit set, fruit development, young fruit drop, and means of controlling fruit drop. Proved control measures are superficial cultivation to avoid root disturbance, frequent light irrigation during the critical period, and, in the rainier parts of North Africa or in irrigated plantations, the application of at least 300 g. nitrogen per tree at least a month before flowering. Good results are sometimes given by (1) the use of a less vigorous rootstock, e.g. trifoliate instead of sour orange for clementine; (2) pruning to thin flowers and young fruits, to stimulate the production of young wood, and to let in light and air and thus improve assimilation; and (3) the ringing of too vigorous trees such as the clementine.

4208. SERVICE DE L'HORTICULTURE, RABAT.
Note sur la mise à fruit du clémentinier. (**Note on inducing bearing in the Clementine orange.**)
*Terre maroc.*, 1954, **28**: 132-3, illus.

A further account is given of a successful method of inducing bearing in Clementines by ringing [see *H.A.*, 22: 2956]. Some amendments have been made in the technique. It is now recommended that both framework and secondary branches should be ringed and that the first cut should be made when the flowers on the south side of the tree are fully open.

4209. AUGUSTE, A.
Étude sur la fructification du clémentinier. (**Study on the fruiting of Clementines.**)
*Fruits et Prim.*, 1954, **24**: 182-91, illus.

Factors affecting the fruiting of the Clementine orange are discussed. The most successful method of obtaining a good yield is by annual ringing, which resulted in a yield of 407 quintals per ha. as compared with 197 quintals per ha. in the control. The performance of a fertile clone "Clémentine Monréal" is described. This is early, more free bearing and produces fruits regular in size and containing many pips. Recently a seedless mutation has been discovered.

4210. Praloran, J. C.
Rapport sur la mise à fruits du clémentinier par la méthode d'incision annulaire double. **(Studies on attempts to induce bearing in the Clementine orange by double ringing.**
*Fruits et Prim.*, 1954, **24**: 138-46.

In experiments over 6 years in Morocco, aimed at improving yields of Clementine oranges, the most satisfactory result was obtained by double ringing. The maximum result was obtained when the first incision was made between full bloom and petal-fall and the second incision 3 weeks later and 5 cm. below the first. The trees were kept in a vigorous vegetative condition by irrigation and fertilizing with 1 kg. N, 0·25 kg. $P_2O_5$ and 0·30 kg. $K_2O$ per tree.

4211. Eteneau, J., and Praloran, J. C.
Rapport sur l'effet de pulvérisations d'acide 2-4 D sur la chute des fruits murs des agrumes. **(Report on the effect of 2,4-D sprays on the drop of mature citrus fruits.)**
*Fruits et Prim.*, 1954, **24**: 125-37, bibl. 9.

Spraying citrus with salts of 2,4-D against premature fruit drop gave varied results under Moroccan conditions. Sprays applied in mid-December and mid-February of 8 p.p.m. 2,4-D to Washington Navel showed only a slight reduction in fruit drop. With Marsh Seedless grapefruit sprays at 8 p.p.m. kept almost the whole crop on the tree until the beginning of June. No results were obtained with Valencia Late using concentrations between 4 and 24 p.p.m.

4212. N.S.W. Division of Horticulture.
**Hormone sprays. Stop-drop effects of May-June applications of 2,4-D on navels weaken after September.**
*Citrus News*, 1954, **29**: 59.

Applications of 2,4-D for preventing fruit drop at the post-maturity stage are made at concentrations of 11 p.p.m. near the coast, and of 22 p.p.m. in the west of New South Wales. A tendency for fruit coarsening, and biennial bearing, has been observed in trees sprayed with 22 p.p.m.; such effects are not given by 11 p.p.m. sprays, which are only slightly less effective. The efficiency of 2,4-D sprays applied during May and June lasts until September, after which loss of effect is rapid. One application of 8 p.p.m. 2,4-D on Valencias in November after spring growth had matured, gave a 10% improvement in fruit size.

### *Citrus—fruit composition.*

(*See also* 4264c, g, w.)

4213. Smith, P. F., and Reuther, W.
**Mineral content of oranges in relation to fruit age and some fertilization practices.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 80-5, bibl. 10.

Analyses were made of the mineral content of the whole fruit and juice of Valencia oranges from trees on rough lemon stock, which had been receiving N, P and K at various rates. The various mineral elements were found to enter the maturing fruit at different rates. Calcium was taken up only in the first few months of fruit development. Potassium was the dominant element in the fruit, and was taken in continuously as the fruit developed to maturity. This was also true to a lesser extent for nitrogen, boron, sodium, aluminium and possibly iron. Other elements, namely copper, zinc, manganese, phosphorus and magnesium, appeared to stop entering the fruit in the autumn, several months before Valencia oranges reach maturity. The mineral composition of fruit was relatively unaffected by N or P fertilizing; the K content of the fruit was increased by fertilizing with K, and the K content of the peel was affected to a greater extent than that of the juice.

4214. Lynch, S. J., Goldweber, S., and Rich, C.
**Some effects of nitrogen, phosphorus and potassium fertilization on the constituents of Persian lime fruits.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 224-7, bibl. 7.

Persian and Idemore limes on rough lemon rootstocks received fertilizer programmes in which the levels of N, P and K were varied. Analyses of the juice showed that the N content increased with N fertilization, and that increased K fertilizer caused an increase of K and P in the juice.

4215. Deszyck, E. J., and Sites, J. W.
**The effect of borax and lead arsenate sprays on the total acid and maturity of Marsh grapefruit.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 62-5, bibl. 12.

During the years 1950 to 1953 studies were made on the effect of borax and lead arsenate sprays, applied separately and together, on the total acid content and legal maturity of grapefruit from mature Marsh trees on rough lemon. Borax sprays increased the total acid content and depressed the ratio values, thus delaying legal maturity. By contrast, lead arsenate sprays at a rate of 0·4 lb./100 gal. produced legal maturity during the middle of the fruit season, and at 1¼ lb./100 gal. in the early fruit season. Borax when used with lead arsenate delayed maturity by 10 days as compared with lead arsenate alone.

4216. Blondel, L.
Les normes de qualité des agrumes. **(Citrus quality standards.)**
*Fruits et Prim.*, 1954, **24**: 229-31.

Biochemical studies on citrus fruit maturation have been conducted at the Boufarik Arboricultural Experiment Station for 12 years. Notes are given on the chief tests used, namely rind colour, juice content and juice composition, and on factors which affect testing. Subjects requiring study are the development of better methods of testing navel oranges and grapefruits, the design of a more efficient juice extractor, and the use of other tests such as a soluble solids/acids/juice ratio, fruit density, penetrometer tests, and determination of the specific colour of the rind and pulp. Existing tests could be simplified for mandarins and clementines.

### *Citrus—frost effects.*

4217. Stugard, B., and Burke, J. H.
**Observations on the citrus industry in Spain after the freeze of February, 1954.**
*Foreign Agric. Circ.* **FCF 6-54**, 1954, pp. 18.
Anon.
**Report on the Spanish citrus freeze.**
*Citrus Mag.*, 1954, **16** (12): 8-9, 12-13, 16-17, 23-4, illus.

This evaluates the changes in Spain's citrus industry following the severe freeze of February 1954 and supplements *Foreign Agric. Rep.* 77 issued just before it under the title "Recent changes in the citrus industry in Spain". The valley lemon plantings at Murcia and the inland citrus areas near Valencia of the Ribera and part of Castellon suffered, the damage consisting mainly of complete defoliation. The trees were, however, making a rapid recovery in April and a return to normal production is expected in 1955/56.

4218. LUCAS, J. W.
**Subcooling and ice nucleation in lemons.**
*Plant Physiol.*, 1954, **29**: 245-51, bibl. 41, illus.

Investigations on low temperature phenomena in lemon tissue showed that detached vesicles were readily subcooled [supercooled] to −12° C. The spread of freezing in lemon tree parts, all portions of which were subcooled, was shown to be very rapid, in branchlets the crystallization velocity being more than 15 cm. per minute. Humidity of surrounding air or moisture on the fruit surfaces had no effect on the ice nucleation point of detached lemons. Fruits submerged in alcohol subcooled more than those in air. Fruits peeled before submersion in alcohol subcooled even more than unpeeled fruits in alcohol. A hypothesis that ice nucleation in a subcooled lemon takes place upon freezing nuclei of atmospheric origin near the fruit surface has been developed. Further, the theory that rubbing wet fruit surfaces may greatly hinder subcooling has been experimentally proved. [For a preliminary account of this work see *H.A.*, 24: 1852.]

### *Citrus—diseases and pests.*

(*See also* 3642, 3685, 3697, 4264b, d, h, l, q-s, 4265b.)

4219. GRIFFITHS, J. T., AND THOMPSON, W. L.
**Reduced spray programs for citrus for canning plants in Florida.**
*J. econ. Ent.*, 1953, **46**: 930-6, bibl. 7.

Valencia orange and grapefruit trees, untreated, dusted with sulphur only, and receiving a complete spray programme were compared over 4 years for pest and disease incidence, fruit quality and yields. The results showed that, while external quality of fruit was inferior on the unsprayed trees, yield and internal quality were as good as on sprayed trees. Where fruit is produced for canning this suggests definite possibilities for reducing the total number of sprays and dusts.

4220. CHARNOT, A.
Rapport sur le gaufrage des oranges.
**(Report on creasing in oranges.)**
*Fruits et Prim.*, 1954, **24**: 147-64, illus.

Creasing in oranges is a disorder of unknown origin which became serious in Morocco in 1949–1950. Biochemical analyses made on fruit and leaves from healthy and affected trees showed that the Ca and $CO_2$ content of the mesocarp of healthy fruits was smaller on the shaded half of the fruit, and this difference was even more marked in creased fruits. Leaves from the shaded half of healthy trees also showed lower Ca and $CO_2$ contents than leaves from the unshaded half, but in these trees the Ca and $CO_2$ contents of the leaves was always lower than those of the leaves of affected trees. Further cultural tests are being carried out.

4221. RODNEY, D. R., AND BOSWELL, S. B.
**Sodium—a factor in lemon collapse.**
*Citrus Leaves*, 1954, **34** (7): 11, 29.

In California, root analyses of lemon trees showing signs of decline were compared with those of healthy trees. In one study 3 Eureka and 3 Lisbon strains on sweet orange and sour orange rootstocks were compared. Sour orange roots usually contained more Na than sweet orange roots. With sour orange, root tissues of trees with a lemon strain showing decline symptoms were consistently found to contain more Na than those where the scion was more vigorous. In a second study with Eureka on grapefruit, roots of trees near collapse contained several times as much Na as was found in the roots of slightly declined trees.

4222. KOZLOVA, V. I.
**Psorosis—a dangerous disease of citrus.** [Russian.]
*Sad i Ogorod*, 1954, No. 4, p. 51.

Psorosis on citrus can be identified by mosaic-like spots on the leaves much earlier than by scaly bark. It was found that the leaf spots appear usually in late May–early June, and plantations, especially those from which budwood is taken, should be kept under close observation during that period.

4223. NORMAN, P. A., AND GRANT, T. J.
**Preliminary studies of aphid transmission of tristeza virus in Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 89-92, bibl. 10.

A preliminary study of aphid transmission of the mild tristeza virus in Florida showed that *Aphis spiraecola* and *A. gossypii* could act as vectors, although they gave low percentages of experimental transmissions. Infected Temple orange plants appeared to be a more satisfactory source of tristeza virus than Valencia orange or Key lime plants.—Bur. of Ent., and Bur. of Pl. Ind., Orlando, Fla.

4224. NESTERENKO, G. A.
**Control of mal secco disease on citrus.** [Russian.]
*Sad i Ogorod*, 1954, No. 4, pp. 49-50.

Symptoms of mal secco [*Deuterophoma tracheiphila*] are described and precautions are suggested for preventing its spread, including examination of budwood and spraying with bordeaux mixture in the nursery. Factors encouraging the disease in lemon trees are too vigorous shoot growth and acid, damp soils. For correction of these conditions the use, respectively, of organic N only, liming and drainage are recommended. Young infected trees under 3 years should be removed and on older trees all diseased branches should be cut out. The application of bordeaux is also recommended, at a 3% concentration in the spring and autumn and at 1% after flowering in August.

4225. STEPANOV, K. M., AND ŠALYŠKINA, V. I.
**Root infection of lemons with the fungus *Deuterophoma tracheiphila* Petri.** [Russian.]
*Bot. Zurnal*, 1954, **39**: 103-8, bibl. 8.

Pieces of *D. tracheiphila* infected shoots brought in contact with wounded roots of young lemon plants grown in a tea plantation did not transmit the disease to the roots. In an extended test on young lemons grown in a mal secco diseased old lemon plantation direct contact of wounds with the source of initial infection did result, under favourable conditions, in some root infection. In spite of the chances of natural root infection being very remote, it is recommended that diseased prunings should be removed from citrus soils.

4226. Suit, R. F., and others.
**Factors in the control of the burrowing nematode on citrus.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 46-9, bibl. 4.

The burrowing nematode, *Radopholus similis*, is known to cause decline in 4 citrus rootstocks, namely rough lemon, sour orange, sweet orange and grapefruit. A list of other host plants is given. At present the best method of control is by removal of the diseased trees plus 4 good trees in advance, followed by soil fumigation with D-D injected to a depth of 10 to 12 inches. Young trees may be planted 2 months after treatment.

4227. da Fonseca, J. C.
Alguns aspectos da entomologia dos citrinos no Levante Espanhol. **(Some aspects of the entomology of citrus orchards in the Spanish Levant.)**
Reprinted from *Agros.*, 1952, **35** and **36**, pp. 65, bibl. 34, illus.

An account is given of a visit to citrus orchards, research stations and insecticide factories in eastern Spain. The chemical control of the principal insect pests, mainly scales, and of physiological disorders and psorosis is discussed. Notes are also given on the use of *Cryptolaemus montrouzieri*, *Leptomastix dactylopii* and *Novius cardinalis* in the control of *Pseudococcus citri* and *Icerya purchasi*.

4228. Gerhardt, P. D.
**Chlordane, dieldrin, aldrin, and heptachlor for control of the Argentine ant in California citrus orchards.**
*J. econ. Ent.*, 1953, **46**: 1063-6, bibl. 12.

Heptachlor, dieldrin, chlordane and aldrin sprays applied to the trunks of, and ground beneath, citrus trees gave good control of the Argentine ant, *Iridomyrmex humilis*. The materials applied at 2 lb. of active ingredient per 100 gal. were more effective than at a 1 lb. rate, and emulsions gave more satisfactory results than suspensions.

4229. Atkins, E. L., Jr.
**Control of cutworms on citrus.**
*Calif. Agric.*, 1954, **8** (7): 15-16, illus.

Considerable damage may be caused by larvae of the citrus cutworm, *Xylomyges curialis*, which feeds on spring growth and newly set fruit, as well as on mature fruit. It is usually difficult to find the larvae on the trees; thus a test spray of 50% wettable DDT is recommended, and if more than 10 larvae per tree are found after spraying, the grove needs treatment. Insecticides which have given effective control are: 50% wettable DDT at 10 lb. per acre; 40% wettable toxaphene at 15 lb. per acre; 50% wettable DDD at 10 lb. per acre; and 25% wettable parathion at 8 lb. per acre.

4230. Pratt, R. M., and Thompson, W. L.
**Spray programs, varieties, and weather conditions in relation to six-spotted mite and purple mite infestations.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 65-9, bibl. 3.

Over a period of 3 years it was found that 6-spotted mites (*Tetranychus sexmaculatus*) tended to recur in the same groves, where their abundance was influenced by location, spray programme, and variety. Low winter temperatures, particularly those of December, were followed by severe spring infestations. In 1953 abundant rain in March and April caused considerable mite mortality in the field. With purple mite (*Metatetranychus citri*) a reduction in mite activity also generally followed an increase in rainfall; the effect is probably not direct, and may be caused by a parasitic fungus. Peak infestations of 6-spotted and purple mites tend to occur at the same time and to be of similar magnitude.

4231. Georghiou, G. P.
**The citrus bud mite, *Aceria sheldoni* (Ewing).**
*Countryman, Nicosia*, 1954, **8** (6): 7-8, illus.

A brief account is given of the citrus bud mite, which has only recently been observed as a pest of citrus in Cyprus. Only lemons have been seriously injured. Good control can be obtained with 2 applications of a light medium oil at $1\frac{2}{3}\%$ to 2%, the first in late June and the second in late September.

4232. Riehl, L. A., and Carman, G. E.
**Narrow-cut petroleum fractions of naphthenic and paraffinic composition for control of California red scale.**
*J. econ. Ent.*, 1953, **46**: 1007-13, bibl. 15.

Results of field experiments investigating the relation of chemical composition and physical properties to the insecticidal efficiency of 2 series of highly refined petroleum fractions against California red scale, *Aonidiella aurantii*, on orange trees are reported in this paper. It was found that the highly paraffinic oils are more efficient than naphthenic oils, and that the insecticidal efficiency of petroleum oils for the control of this scale is correlated with increasing molecular weight within the range 220 to 360.—Calif. Citrus Exp. Stat., Riverside. [See also *H.A.*, 23: 3472.]

4233. Riehl, L. A., and Jeppson, L. R.
**Narrow-cut petroleum fractions of naphthenic and paraffinic composition for control of citrus red mite and citrus bud mite.**
*J. econ. Ent.*, 1953, **46**: 1014-20, bibl. 13.

The efficiency of distinctly naphthenic and paraffinic types of refined petroleum oil for the control of citrus red mite, *Metatetranychus citri*, and citrus bud mite, *Aceria sheldoni*, on orange and lemon trees was studied in the field. Experimental results showed that against citrus red mite paraffinic composition is more efficient than naphthenic composition, and that the critical value of molecular weight for highly paraffinic petroleum oils occurs at approximately 340. In control of citrus bud mite no association between efficiency and molecular configuration or size was evident.—Calif. Citrus Exp. Stat., Riverside.

4234. Riehl, L. A., Bartholomew, E. T., and LaDue, J. P.

**Effects of narrow-cut petroleum fractions of naphthenic and paraffinic composition on leaf drop and fruit juice quality of citrus.**

*J. econ. Ent.*, 1954, **47**: 107-13, bibl. 13.

Narrow-cut fractions of distinctly naphthenic and paraffinic types of highly refined petroleum oil were applied in aqueous sprays at 1, 2 and 4 qts per 100 gal. to lemon and Valencia and Navel orange trees. The effects of these sprays on leaf drop and fruit juice quality were compared with those of 2 proprietary California citrus spray oils used at 7 qts per 100 gal. (1·75%). Leaf drop from trees treated with naphthenic oils and with paraffinic oils was similar and was no greater than from trees sprayed with California spray oils. No improvement in juice quality occurred from treatments with the narrow-cut fractions.

4235. Cressman, A. W., Broadbent, B. M., and Munger, F.

**Some factors influencing the effectiveness of parathion against California red scale.**

*J. econ. Ent.*, 1953, **46**: 1071-4, bibl. 6.

Natural factors that are important in the efficient use of parathion alone and combined with oil for control of the California red scale, *Aonidiella aurantii* (Mask.), were investigated in the field and laboratory in California between 1948 and 1952. Mortality of the scales after field sprays of parathion was lowest on the fruit, highest on the gray wood, and intermediate on the green twigs. The kills by oil plus parathion were nearly equal on all parts of the tree. Density of infestation had no effect on kill by parathion alone. With oil plus parathion there was some decrease in kill at very high levels of infestation, but little or no effect within the range of scale density usually encountered. Differences in temperature after spraying had no effect on the final kill when scales were reared under uniform conditions up to the time of spraying in the laboratory. The rate of kill was faster at high temperatures. [Authors' summary.]

4236. Cressman, A. W., Broadbent, B. M., and Munger, F.

**Concentrations of oil and parathion for control of California red scale.**

*J. econ. Ent.*, 1954, **47**: 100-2, bibl. 3.

On lemon trees sprayed in May 1951 and March 1952, 1·8% oil with 0·5 lb. of 25% parathion per 100 gal. was more effective against California red scale, *Aonidiella aurantii*, than 1% oil with parathion. When the quantity of parathion was increased to 1 lb., spray mixtures containing 1% oil were as good as those containing 1·8% oil and better than those containing 0·5 lb. parathion with 1·8% oil. In a subsidiary trial this last mixture gave more satisfactory control of citrus red mite, *Paratetranychus citri*, than 0·5 lb. parathion with 1% oil. To prevent leaf drop, oil with parathion should be applied to citrus only when there is adequate soil moisture.

4237. Spencer, H., Osburn, M. R., and Norman, P. A.

**Control of the purple scale on citrus with parathion.**

*Circ. U.S. Dep. Agric.* **896,** 1952, pp. 10, bibl. 3.

In 14 out of 15 comparisons made in Florida over the 4 years 1947–50 parathion gave control of purple scale (*Lepidosaphes beckii*) on oranges and grapefruit as good as, or better than, oil-emulsion sprays. For heavy infestations 2 lb. of 15% or 1 lb. of 25% wettable parathion per 100 gal. were needed, but for light infestations 1 lb. of 15% parathion was adequate. Two applications per year were sometimes needed. Parathion produced better fruit quality than did oil, and no residues were found apart from minute quantities in the peel. [See also *H.A.*, 24: 3062.]

4238. Spencer, H., and Norman, P. A.

**Control of heavy infestations of purple scales on grapefruit trees.**

*Citrus Mag.*, 1954, **16** (12): 10-11, bibl. 3.

Further experiments [see preceding abstract] were made in 1950–52 to control heavy infestations of purple scale (*Lepidosaphes beckii*) on grapefruit and orange trees sprayed with copper and with nutrients. The addition of 2 lb. of 15% wettable parathion to the postbloom combination spray and 1 lb. each to the summer and fall wettable sulphur sprays gave effective control. After the first year 1 lb. in each of the sprays would probably be sufficient.

4239. Service de la Protection des Vegetaux, Algérie.

Essais de destruction des cochenilles. (**Scale control tests.**)

*Terre maroc.*, 1954, **28**: 199-201.*

Experiments were conducted over a period of 2 years with a view to finding alternatives to the mineral oil emulsions at present used against citrus scales in Algeria, because the oils do not give an entirely satisfactory degree of control and are phytotoxic. It was found that SNP can be (1) substituted for mineral oils in the control of *Pseudococcus citri*, and (2) used to fortify them in the control of *Chrysomphalus dictyospermi*, *Lepidosaphes citricola* and *Parlatoria ziziphi*, enabling lower concentrations to be used. Recommended treatments are 0·03% SNP against *P. citri*; either 0·02% SNP plus 0·08% oil or 0·01% SNP plus 1·6% oil against *C. dictyospermi* and *L. citricola*; and 0·02% SNP plus 1·6% oil or 0·03% SNP emulsion against *P. ziziphi*.

4240. Smirnoff, W.

Observations sur l'emploi d'ester thiophosphorique dans les vergers d'agrumes. (**Observations on the use of a thiophosphoric ester in citrus orchards.**)

*Fruits et Prim.*, 1954, **24**: 178-81.

The predators and parasites of scale insects present in a Moroccan citrus orchard were recorded before and after spraying with a thiophosphoric ester. The results are tabulated and show a serious disturbance in the natural balance of the orchard fauna.

4241. Muma, M. H.

**Predators and parasites of the citrus tree snail.**

*Citrus Mag.*, 1954, **16** (10): 8-9, illus.

The snail *Drymaeus dormani* is beneficial to citrus trees in that it removes sooty moulds from leaves and fruit. Parasites found attacking it are recorded.

---

* Extract from *Rapp. Cons. Exp. Rech. agron. Algér.*, 1953.

### *Citrus—packing, storage and by-products.*

4242. GRIERSON, W., AND NEWHALL, W. F.
**Degreening conditions for Florida citrus.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 42-6, bibl. 6.

Experiments were carried out to determine the optimum degreening temperatures for oranges and grapefruit. For Hamlin and Valencia oranges degreening was most rapid at 85° F., but minor variations above or below these temperatures caused appreciable slowing down of the process. No correlation was found between humidity and rate of degreening. In theory, the most rapid degreening of Marsh grapefruit should take place at 88° F., but fruit stored at temperatures above 85° F. showed an increase in fungal rots and excessive shrinkage.

4243. BIALE, J. B.
**Physiological requirements of citrus fruits.**
*Citrus Leaves*, 1954, **34** (7): 6-7, 31, 33.

Some experiments on the ripening processes of citrus fruits carried out at Davis, California, are described, and their application to the handling of citrus fruits is discussed. In a previously reported experiment [noted in *H.A.*, 19: 1639d] vapours, identified as ethylene, given off by *Penicillium digitatum*, a storage mould of lemons, were shown to increase the respiration rate and accelerate the colour change in lemons. Similar effects were later obtained with Valencia and Navel oranges and Marsh Seedless grapefruit.

4244. SMITH, R. J., AND FULTON, R. E., Jr.
**New table permits faster, easier lemon grading.**
*Citrus Leaves*, 1954, **34** (6): 14, illus.

A grading table developed by the University of California has two main features: (1) it is designed to roll the fruit towards the operator to enable her to see it to best advantage; and (2) the design enables her to divert any fruit she wishes with the simplest of hand motions. The operator can be seated comfortably or stand, as desired.

4245. HALL, E. G.
**Diphenyl wraps may be ineffective if care not taken to prevent loss of volatile chemical from packets before use.**
*Citrus News*, 1954, **24**: 47-8.

Diphenyl wraps should be stored in a cool dry place away from draughts in order to conserve their content. Storage conditions for wrapped fruit will also affect the efficiency of the wrap; thus at 45° F., only 45% of the diphenyl had volatilized after 11 weeks.

4246. LOEST, F. C., KRIEL, H. T., AND DEETLEFS, J. DU T.
**Citrus wastage studies.**
*Citrus Gr*, 1954, No. 243, pp. 3-8, bibl. 6.

Consignments of Valencia and Navel oranges were shipped to the United Kingdom from S. Africa. Treatments applied to the fruits were warm water, 0·15% Dowicide A (containing sodium orthophenylphenate) or 0·15% Dowicide A plus 200 p.p.m. 2,4-D. Overall wastage losses were approximately halved by the 2,4-D+Dowicide treatment. Dowicide alone was scarcely better than warm water.

4247. KLOTZ, L. J., AND ROISTACHER, C. N.
**Fungistats and fungicides to control blue-green mold.**
*Citrus Leaves*, 1954, **34** (6): 18.

Preliminary screening tests have been carried out at the California Citrus Experiment Station to find suitable volatile fungicides for citrus fruit protection. The following were found to be effective in reducing fruit losses: formaldehyde, paraformaldehyde, acetaldehyde, glyoxal, tetraiodoethylene, tetrachlorethylene, 1-2-3 trichlorobenzene, methyl borate and several volatile carbamates.

4248. ISLIP, H. T., AND MATTHEWS, W. S. A.
**The effects of storage on sweet orange oil.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 35-41.

Samples of expressed sweet orange oil were stored for 6 months under 4 conditions. The results indicate that of the 3 factors generally recognized as desirable, namely low temperature, absence of air and absence of light, the first is the most important. In the present test 4°–5° C. proved satisfactory but even lower temperatures would probably be advantageous for prolonged storage.

4249. GADEN, E. L., Jr., PETSIAVAS, D. N., AND WINOKER, J.
**Citrus waste utilization. Microbiological production of riboflavin and citric acid from citrus molasses.**
*J. agric. Food Chem.*, 1954, **2**: 632-8, bibl. 29.

Riboflavin and citric acid were produced on a variety of citrus molasses substrates by *E. ashbyii* (NRRL 1363) and *A. niger* (NRRL 599), respectively. These experiments were not conducted to develop a method for riboflavin production competitive with existing processes. While the results, indicating long fermentation times and relatively low yields, do not offer much promise for the fermentation as a primary riboflavin source, the enrichment of citrus molasses in this manner seems much more reasonable. [From authors' summary.]—Dep. chem. Engineering, Columbia Univ., New York.

### *Dates.*

4250. PAKISTAN CO-OPERATION AND MARKETING DEPARTMENT.
**Report on the marketing of dates in Pakistan.**
*Market. Ser. Rep. Pakistan Co-op. Market. Dep.* **C. and M.A.—6,** [1954?], pp. 31, illus.

Pakistan is at present an importer of dates but would have an exportable surplus after supplying domestic needs if her date growing and marketing industries were properly organized. Recommendations include the setting up of co-operative societies for growers, improvement in picking, curing, packing and preservation and the establishment of a research station at Sukkur or Muzaffargarh.

### *Litchis.*

4251. NELSON, R.
**High humidity treatment for air layers of lychee.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 198-9, bibl. 4.

At the University of Miami Experimental Farm, trials were made on the hardening-off of litchi marcots. The marcots were quickly potted, after removal from the parent tree, into a well-drained soil mixture, foliage being removed only when shaping was necessary. The plants were then placed in a slathouse under mist conditions. Two weeks after potting, rooting was well advanced and the water spray was gradually reduced, until, at the end of the third week, water was given only when necessary. The trees were planted out 1 month after potting. Losses were less than 5% and only occurred as a result of inadequate mist distribution.

4252. Mustard, M. J., Liu, S. Y., and Nelson, R. O.
**Observations of floral biology and fruit-setting in lychee varieties.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 212-20, bibl. 3, illus.

An investigation in 2 areas of Florida into the floral biology of litchi showed that the panicle bears 3 types of flower, viz. staminate, and hermaphrodite functioning as female or as male [one author gave a slightly different classification]. These flowers appeared consecutively on the same panicle, but with no sharp demarcation line between the types. The pollen produced by the different flowers varied in structure and viability. The highest percentage shedding of young fruit occurred during the first month after set. The shedding of young fruit may be partially attributed to failure in fertilization and to embryo abortion.—Univ. Miami, and Univ. Michigan.

### *Macadamias.*

(*See also* 4265a.)

4253. Hamilton, R. A., and Storey, W. B.
**Macadamia nut varieties for Hawaii orchards.**
*Hawaii Fm Sci.*, 1954, **2** (4): 2-3, illus.

Notes are given on the 5 most promising varieties, namely Kakea, Ikaiki, Keauhou, Wailua and Nuuanu.

4254. Schroeder, C. A.
**A useful hand nutcracker for macadamia nuts.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 69, illus.

Developed from a large pair of pliers, the nutcracker, which is pictured, has proved useful for examining nut samples.

### *Olives.*

(*See also* 3338, 3666, 4264i, m, 4265e, 4459, 4487.)

4255. Di Prima, S.
La metodologia bio-statistica nella classificazione delle varietà con particolare riferimento all'olivo. (**The bio-statistical method of classifying varieties with particular reference to the olive.**) [English summary 10 lines.]
*Ann. Sper. agrar.*, 1954, Vol. **8**, No. 4, *Suppl.*, pp. xvii-xxxi, bibl. 54.

The author believes in the need for a biometrical method of describing and classifying plant varieties. He applies the method to the olive and classifies 108 Italian varieties on the basis of 6 characters from which a varietal index is calculated for each. The 6 characters are: relationship between length and breadth of stone, relationship between length and breadth of leaf, length of stone, breadth of leaf, length of leaf, and breadth of stone.

4256. Cilli, L. M.
Il manganese nella biologia dell'olivo. (**Manganese in the biology of the olive.**) [English summary 8 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 969-79, bibl. 19.

The manganese content of the leaves, shoots, fruit pulp and kernels of a number of olive varieties growing on different soils in the Abruzzi was determined. Mn was present in all the organs studied, the content being highest in the leaves and the leaf content being higher in the spring than in the winter. Trees on dry clay soils had the highest content. No Mn deficiency was observed, but vigorous trees had a high, and low-yielding trees a relatively low, content.—Staz. sper. Olivic. Oleific., Pescara.

4257. Graniti, A.
La "lebbra" delle olive in Sicilia. (**Olive anthracnose in Sicily.**) [English summary 11 lines.]
*Not. Mal. Piante*, 1954, **27**: 27-32, bibl. 8, illus.

In 1952 and 1953, olive anthracnose (*Gloeosporium olivarum*), of which this is the first report in Sicily, caused defoliation and serious damage to the fruit of the 2 varieties cultivated in an area near Cassaro, particularly in November/December and in low-lying humid sites. Control recommendations are improved drainage and 2–3 cover sprays of 1% bordeaux mixture, the first of them before the autumn rains.—Ist. Pat. veg., Univ. Catania.

4258. Pélécassis, E. D.
Essais de laboratoire pour déterminer l'action de divers insecticides sur la mouche des olives, *Dacus oleae* Rossi. (**Laboratory tests on the effects of certain insecticides on the olive fly, *Dacus oleae*.**)
*Ann. Inst. phytopath. Benaki*, 1953, **7**: 36-9.

50% methoxychlor (marlate) at 2% was the best of 5 insecticides used in laboratory tests made in 1949/50. Dissolved in acetone it gave 100% knock-down after 30 and 85 minutes when adult flies were introduced 1 day and 1 month after the treatment of the cages as compared with 3 and 3¾ hours in the control. Corresponding figures when the insecticide was dissolved in benzene were 80 and 105 minutes as compared with 4 and 5 hours in the control.

4259. Koronéos, J. A., Papadopétros, G., and Kyriafinis, B.
Expérience préliminaire de lutte contre le *Dacus oleae* par le parathion en 1953. (**A preliminary experiment on the control of *Dacus oleae* with parathion in 1953.**) [Greek, with French summary 1¼ pp.]
*Ann. Inst. phytopath. Benaki*, 1953, **7**: 69-94.

20% E.605 at 0·05% gave virtually complete control of the grubs of *Dacus oleae*. The infestation rate in the controls was 75%. It is considered that 3 applications beginning in September should be adequate. Parathion was not effective against heavy early attacks, but these are rare.

4260. BOSELLI, F.
Risultati della sperimentazione antidacica in Sardegna, nel 1952. (**Results of olive fly control experiments in Sardinia in 1952.**) [English summary ¾ p.]
*Ann. Sper. agrar.*, 1954, **8**: 751-71.

Chlorinated hydrocarbon and phosphoric ester insecticides and poison baits were compared for the control of *Dacus oleae* on the Bosana olive, a variety normally subject to late attacks in October. Of the sprays 50% DDT applied 4 times in August-October at 2% and 3% gave the best results, namely 93% and 96% clean fruit compared with 15% in the control, while dieldrin and parathion gave 85% and 70% respectively. Of the baits the Berlese compound gave 34% clean fruit compared with 4% in the control and the others had no effect. Full data are given. Oil from the trees treated with DDT and parathion contained more than the maximum permissible residue.—Osserv. Fitopat., Cagliari.

4261. STAFFORD, E. M.
**Use of parathion to control olive scale.**
*J. econ. Ent.*, 1954, **47**: 287-95, bibl. 3.

In experiments in California, parathion, particularly as a spray, was the most effective insecticide used against the olive scale, *Parlatoria oleae*, on olives and on peaches and plums. The effectiveness of the material was increased by adding a light- or medium-grade oil to the spray. For olives the first part of June was the most suitable time for application. The spray now most widely used is 1 lb. 25% parathion w.p. and 1·5 gal. oil emulsion per 100 gal. On deciduous trees, spring sprays were more effective than dormant sprays, but spring applications have some operational disadvantages. In dormant spray tests on peaches the use of 2 lb. of 25% parathion w.p. permitted the reduction of dormant oil emulsion from 5–6 to 3 gal. per 100 gal. of water, and not only gave better control of the olive scale but also controlled over-wintering eggs of spider mites and overwintering peach twig borer larvae.

4262. DOUTT, R. L.
**An evaluation of some natural enemies of the olive scale.**
*J. econ. Ent.*, 1954, **47**: 39-43, bibl. 2.

The most promising entomophagous insects imported into California for control of olive scale, *Parlatoria oleae*, are sibling species belonging to the *Aphytis maculicornis* complex. One of these forms, designated as the Persian *Aphytis*, has greatly reduced scale populations in several test plots. [See also *H.A.*, 24: 827.]

### *Passion fruit.*

4263. AKAMINE, E. K., AND OTHERS.
**Passion fruit culture.**
*Ext. Circ. Univ. Hawaii* **345,** 1954, pp. 23, bibl. 10, illus.

Six species of *Passiflora* bearing palatable fruits and a further 13 ornamental or wild species occur in Hawaii. Only the purple passion fruit, *P. edulis*, and the yellow passion fruit *P. e.* f. *flavicarpa* are considered to be worth growing commercially, and of these the latter seems to be the best suited to commercial development. This circular describes these 2 varieties, their flowering and fruit setting, propagation by seed and cuttings, planting and spacing, T-type trellising, training, pruning, manuring, pests and diseases, and harvesting. A short section on the selection of strains for processing stresses the need to eliminate types bearing round and orange-coloured fruits; among positive characteristics the most important is flavour.

### *Noted.*

4264.

a AHMAD, S., AND KHAN, M.
**Fruit bud differentiation studies in grapefruit.**
*Agric. Pakistan*, 1952, **3**: 116-24, bibl. 11, illus.
See *H.A.*, 22: 2955.

b ARMITAGE, H. M., AND MCKENZIE, H. L.
**Present status of the olive pollinia scale, *Pollinia pollini* (Costa), in California.**
*Bull. Calif. Dep. Agric.*, 1952, **41**: 115-21, bibl. 6, illus.

c ATKINS, C. D., AND ROUSE, A. H.
**The effect of different methods of juice extraction on the pectic content of Valencia orange juice.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 289-92, bibl. 6.

d CASSIDY, P. H.
**Mexican fruit fly—a threat to California citrus.**
*Citrus Leaves*, 1954, **34** (6): 6-7, 29, illus.
*Anastrepha ludens* described and illustrated.

e CEDERMAN, J. A.
**Maintaining soil fertility in the citrus orchard.**
*N.Z. J. Agric.*, 1954, **88**: 571-8, bibl. 4, illus.
In New Zealand.

f CHAPOT, H.
Anciennes variétés d'agrumes du bassin méditerranéen. (**Old citrus varieties of the Mediterranean basin.**)
*Fruits et Prim.*, 1954, **24**: 173-7.

g CURL, A. L., AND BAILEY, G. F.
**Polyoxygen carotenoids of Valencia orange juice.**
*J. agric. Food Chem.*, 1954, **2**: 685-90, bibl. 22.

h DEAN, H. A.
**Termites in citrus on newly-cleared brushland.**
*J. econ. Ent.*, 1954, **47**: 365-6, bibl. 1.
See *H.A.*, 24: 3065.

i ELANT, H.
L'oléiculture au Maroc. (**Olive growing in Morocco.**)
*Rev. hort. Paris*, 1954, **126**: 1104-6, illus.

j EL-TOMI, A. L.
**Sub-tropical fruit industry in Egypt.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 195-8, bibl. 5.

k Fleschner, C. A.
**Biological control of avocado pests.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 125-9.

l Fleschner, C. A., and Ricker, D. W.
**Typhlodromid mites on citrus and avocado trees in southern California.**
*J. econ. Ent.*, 1954, **47**: 356-7, bibl. 1.
A preliminary note on these predatory mites.

m Francesconi, F.
Una razza umbra di olivo resistente al freddo: la "Nostrale di Rigali". **(Nostrale di Rigali, a frost-resistant olive variety of Umbria.)** [English summary 5 lines.]
*Ann. Sper. agrar.*, 1954, **8**: 1103-16, bibl. 31, illus.
A self-sterile oil variety.

n Garangeat, S.
Les agrumes au Maroc. **(Citrus growing in Morocco.)**
*Rev. hort. Paris*, 1954, **126**: 1100-3, illus.
Including varieties, production and exports.

o Hamilton, R. A., and Storey, W. B.
**The avocado situation in Hawaii.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 142-4, bibl. 4.

p Lee, I. M.
**Insurance based on temperature.**
*Calif. Agric.*, 1954, **8** (6): 2.
Possibilities of temperature, as opposed to frost, insurance of citrus discussed.

q Manefield, T., and Passlow, T.
**The control of common pests of citrus in Central Queensland.**
*Qd agric. J.*, 1954, **78**: 321-4.
Scales, *Phyllocoptruta oleivora*, *Strumeta tryoni* and *Unaspis citri*.

r Martin, H.
**Scale insects on citrus in Tripolitania.**
*FAO Plant Prot. Bull.*, 1954, **2**: 113-16.
Mainly *Chrysomphalus dictyospermi*, *Parlatoria pergandei*, *P. ziziphi*, and *Lepidosaphes beckii*.

s Muma, M. H.
**Lady beetle predators of citrus mites.**
*Citrus Mag.*, 1954, **16** (11): 10-11, illus.
Predators of *Metatetranychus citri* and *Eotetranychus sexmaculatus*.

t Norris, R. E.
**Sub-tropical fruits in central Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 193-5.

u Ochse, J. J.
***Solanum hyporhodium* or cocona.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 211-12.
A fruit plant on trial in Florida.

v Renaud, M.
La fumure des agrumes. **(Manuring of citrus.)**
*Fruits et Prim.*, 1954, **24**: 55-9, bibl. 5.

w Rouse, A. H., and Atkins, C. D.
**Maturity changes in Pineapple oranges and their effect on processed frozen concentrate.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 268-73, bibl. 10.

x Ruehle, G. D.
**Two new fruits for south Florida.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 190-2, bibl. 2, illus.
*Antidesma dallachyanum* and *Dovyalis abyssinica*.

y Singh, U. P.
**A note on hybridization technique in loquat (*Eriobotrya japonica* Lindl.).**
*Indian J. Hort.*, 1954, **11**: 30-1, bibl. 1.

z Stewart, W. S., and Hield, H. Z.
**Increasing fruit sizes with urea and 2,4-D sprays.**
*Citrus Leaves*, 1954, **34** (6): 12-13.
Advice to growers.

4265.

a Storey, W. B., and Hamilton, R. A.
**The macadamia nut industry in Hawaii.**
*Yearb. Calif. Avoc. Soc. 1953/54*, 1954, **38**: 63-7, bibl. 4.

b Stout, G. L., and McClain, R. L.
**Quick decline of citrus.**
*Bull. Calif. Dep. Agric.*, 1952, **41**: 58-60, illus.
Symptoms described and illustrated.

c U.S. Dep. Agric. Foreign Agricultural Service.*
**World citrus production tops 400 million boxes.**
*Foreign agric. Circ.* **FCF 5-53,** 1953, pp. 10.
**World citrus production and trade.**
*Foreign agric. Circ.* **FCF 6-53,** 1953, pp. 10.
**The 1953-54 Mediterranean citrus crop and market outlook.†**
*Foreign agric. Circ.* **FCF 12-53,** 1953, pp. 9.
**World citrus production sets new record at 429 million boxes.**
*Foreign agric. Circ.* **FCF 1-54,** 1954, pp. 6.
Useful data on production of all types of citrus on the international market.

d Vanderford, H. B.
**Tung culture finds a place in south Mississippi.**
*Bett. Crops*, 1954, **38** (4): 18-24, 48-51, bibl. 5, illus.
Notes on tung growing.

e Velazquez Diaz, J.
El olivar granadino. **(Olive growing in Granada.)**
*Bol. Oleic. int.*, 1954, **4** (16): 23-8, illus.
Pruning, total area, spacing, fruit and oil yields.

f Witrant, R., and Breteau, J.
Les marchés de consommation et les courants commerciaux des agrumes du bassin méditerranéen. **(Markets and trade in citrus from the Mediterranean basin.)**
*Fruits et Prim.*, 1954, **24**: 224-8.
Statistics and recommended measures for extending trade.

---

* See also Abstract 4217.  † Compiler J. H. Burke.

# TROPICAL FRUIT AND PLANTATION CROPS.

## *General.*

(*See also* 3328, 3329, 3518, 3781, 4464.)

4266. DU PASQUIER, R.
**The teaching of tropical agriculture in Europe —III: France.**
*Trop. Agriculture Trin.*, 1954, **31**: 223-32.

All higher education in tropical agriculture for French and overseas students is given at institutions in France. These are: (1) École Supérieure d'Application d'Agriculture Tropicale, at 293 Avenue Daumesnil, Paris, where students who already have agricultural or scientific qualifications are prepared for tropical careers. (2) Cycle d'Enseignement d'Agriculture Tropicale, which gives similar preparation to students with lesser academic qualifications; part of this 1-year course is given at the École Supérieure [see above], part elsewhere, as for instance North Africa. (3) Office de la Recherche Scientifique et Technique d'Outre-Mer, which trains agricultural research specialists. This has its headquarters at Paris and scientific research centres in different parts of the tropics.

4267. RUSSELL, O. S.
**A progress report on research in tropical and sub-tropical fruit at the Government Experiment Station, Nassau, Bahamas.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 187-8.

*Mango:* 29 varieties have been collected and a rootstock trial is in progress. *Avocado:* 16 varieties and 10 local selections are under trial. *Breadfruit* (*Artocarpus altilis*): marcotting and mist propagation trials have not been successful. *Coconut:* dwarf and golden coconuts are being propagated for ornamental purposes. *Miscellaneous:* local selections have been made of papaw, white sapote (*Casimiroa edulis*), sugar apple and custard apple (*Annona* spp.), genip (*Melicocca bijuga*), and Barbados cherry (*Malpighia glabra*).

4268. BLAICH, O. P.
*Agriculture in British Guiana, Census 1952*, Vol. **1**, No. 1, pp. 99.

In this valuable compilation are included data on areas under particular crops, and on the condition and production of these crops with, in some cases, estimates of value and method of disposal. Crops include coconuts, rubber, coffee, cacao, citrus of various sorts, bananas, pineapples, papaws and guavas. The biggest single agricultural product is sugar grown by a system of estate agriculture. Coconut is second only to rice of the family farm crops. Land under coffee in 1952 was 4,200 acres, that under cacao 1,000, under rubber—largely neglected—1,800. Citrus, mainly oranges (76%), covered some 2,200 acres. Bananas are the most important single fruit grown in the colony and covered 3,600 acres in 1952. Mangoes were grown on nearly 1,500 acres. The pineapple area was trifling in comparison, viz. 180–190 acres. Other fruits were scattered.

4269. NIGERIA.
*Annual Report on the Agricultural Department Nigeria for the year 1951-52*, 1953, pp. 76, 9d.

Work reported includes: *Cocoa soil survey:* of Western Region. *Chemistry:* oil palm soil studies. *Botany:* trials of Sampson and Lake tangelo and Cleopatra mandarin rootstocks to replace the satisfactory but tristeza-susceptible sour orange; testing lemon varieties for juice production; study of hybrids of Nigerian and Trinidadian cacao. *Plant pathology:* control of cacao black pod disease (*Phytophthora palmivora*) by alternate-daily removal of infected pods and 3-weekly spraying with 1% carbide-bordeaux mixture; control studies on cacao capsids and stem-boring beetles and the mealybug vectors of swollen shoot disease.

4270. TIDBURY, G. E.
**Cloves, the mainstay of Zanzibar's agriculture.**
*Foreign Agric.*, 1954, **18**: 98-9.

The 2 islands of Zanzibar and Pemba together supply most of the world's cloves, producing an average annual yield of 10,000 tons of dried cloves from 3½ million trees; although the industry is threatened by 2 serious diseases, die-back and sudden death, it is active and thriving. Coconuts are the other main crop, 12,000 tons of copra being produced annually. The growing of other crops for export including chillies, oranges, pineapples, tobacco and kapok is being encouraged by the Department of Agriculture.

4271. HÉBERT, J. B.
Les fruits dans l'archipel des Comores. **(Fruits in the Comoro Islands.)**
*Fruits d'Outre Mer*, 1954, **9**: 207-12, illus.

Brief notes are given on indigenous and exotic fruit plants, mostly trees, that are widely grown in the archipelago, on exotic fruit trees of which occasional specimens are seen, and on indigenous plants of which the fruit is rarely eaten by Europeans.

4272. VAN HEUSDEN, W. C.
Het speurwerk van het proefstation der Centrale Proefstationsvereniging. **(Research work at the experiment station of the C.P.V.)**
*Bergcultures*, 1954, **23**: 246-55, illus.

A short review is given of research work, carried out or in progress, on rubber, tea, coffee, cocoa and cinchona, at the C.P.V. Experiment Station, Bogor, Indonesia.

4273. MADAGASCAR, INSPECTION GÉNÉRALE DES SERVICES AGRICOLES.
*Recherche agronomique de Madagascar. Compte Rendue 1953.* **(Agricultural research in Madagascar. Report for 1953)**, No. 2, pp. 144, illus.

This annual report groups work done by the 7 research stations on the island under the following headings: *soil improvement:* foliar diagnosis techniques, prevention of erosion, and soil studies; *plant improvement:* including vanilla, coffee and sugar cane; *mechanical cultivation*; and *plant protection.* [See also separate abstracts.]

4274. MALCOLM, J. L.
**Chelates for the correction of iron chlorosis in sub-tropical plants.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 179-84, bibl. 2, illus.

Iron chelates, applied as drenches around plants, were used successfully to correct iron chlorosis on the following sub-tropical plants growing on alkaline soils: *Abelia* sp., atemoya and ilama (*Annona* spp.), lime (*Citrus aurantifolia*), *Cordia superba*, *Gerbera jamesonii*, *Ixora finlaysonia*, *I. macrothyrsa*, *Hibiscus* sp., *Lagerstroemia thorelli*, litchi, Barbados cherry (*Malpighia glabra*), jaboticaba (*Myrciaria cauliflora*), and avocado. The most successful chelating agent used was the sodium salt of N-hydroxyethylethylenediaminetriacetic acid (EEDTA).

4275. Siddappa, G. S., and Bhatia, B. S.
**The identification of sugars in fruits by paper chromatography.**
*Indian J. Hort.*, 1954, **11**: 19-23, bibl. 4.

The sugars present in 25 different fruits and fruit parts, nearly all tropical, were identified by paper chromatography. Glucose and fructose were present in nearly every case. Sucrose was absent in several species. Mangosteen shell extract contained a small amount of arabinose. Mangosteen juice contained no arabinose, but in addition to sucrose, glucose and fructose a fourth sugar provisionally identified as maltose.

4276. Gow, P. L.
**Proteinaceous bait for the oriental fruit fly.**
*J. econ. Ent.*, 1954, **47**: 153-60, bibl. 15.

In a study in Hawaii yeast, soya, lactalbumin and casein hydrolysates, and a vitamin-B preparation called Lederplex were all attractive to the oriental fruit fly, *Dacus dorsalis*, soya hydrolysate being somewhat superior to the others. The performance of the most effective soya meal bait, SM-14, in attracting female fruit flies was superior to that of other baits tested in Hawaii, but in its present formulation was not suitable for practical control. SM-14 also proved attractive to the melon fly, *Dacus cucurbitae* and the Mediterranean fruit fly, *Ceratitis capitata*.

### *Bananas.*

(*See also* 4494c.)

4277. Jameson, J. D.
**Bananas.**
*Rec. Invest. Uganda Dep. Agric. 1950/52*, 3, 1954, pp. 22-3.

Eight varieties of banana (*Musa acuminata*), which is the staple food of the Baganda people were compared to determine which were most tolerant of neglect. Mulching (the traditional method) was compared with no mulching. Nakabululu offered by far the best prospects both under mulching and under no-mulching. It was the strongest grower—therefore providing the best shade and the greatest quantity of mulching material—and it was the highest yielder. All varieties yielded less with no mulching, the varieties Sira and Mbwazirume in particular being intolerant of poor conditions.

4278. Nayar, T. G.
**Manurial experiments with the Poovan banana (1).**
*Indian J. agric. Sci.*, 1953, **23**: 283-8, bibl. 10.

In Madras a field trial on the manuring of bananas was designed to evaluate the effects of different manurial practices on growth and yield. Results showed that the best response was given by $\frac{1}{4}$ lb. N supplied as cattle manure with $\frac{1}{4}$ lb. N as ammonium sulphate, applied in 2 doses, 3 and 5 months after planting: the substitution of groundnut cake for cattle manure was almost as satisfactory. Under the conditions of the experiment, namely the wet, heavy clay soils of Aduthurai, there was no response to the addition of K or P.

4279. Steward, F. C., and Simmonds, N. W.
**Growth-promoting substances in the ovary and immature fruit of the banana.**
*Nature*, 1954, **173**: 1083-4, bibl. 9.

The general conclusions drawn by the authors from their experiments are that there occur in the ovaries of both parthenocarpic and seeded bananas growth-promoting substances of the same general nature as occur in coconut milk. It seems reasonable to infer that they are, at least in part, responsible for the growth of the undifferentiated starchy parenchyma that fills the edible banana fruit and surrounds the seeds in seeded kinds. That they may not be solely responsible is suggested by the evidence that auxin-like substances are also involved.—Cornell Univ. and Imp. Coll. trop. Agric., Trinidad.

4280. Brun, J.
La "fausse mosaique" du bananier. (**False mosaic of the banana.**)
*Fruits d'Outre Mer*, 1954, **9**: 168-9, bibl. 3.

False mosaic was first observed in French Guinea in November 1952 and serious attacks began in the spring of 1953. The symptoms are groups of numerous, short, dark streaks parallel with the secondary veins followed by drying of the leaf from the edges in severe attacks. In infected plants the fruits are often small and ripen badly and stem drop sometimes occurs. The pathogen is believed to be a *Hormodendron* sp. It chiefly attacks young plantations. Attacks reach their maximum severity at the beginning and end of the rains. Tests in progress show that copper salts may give control.

4281. Castillo, B. S.
**Transmission studies on banana mosaic in the Philippines. Progress Report No. 1.**
*Philipp. J. Agric.*, 1954, **17**: 91-7, bibl. 6, illus.

In experiments made in 1951 banana mosaic was transmitted by *Aphis gossypii* and *A. maidis* but not by *Pentalonia nigronervosa* or mechanically.

4282. Stover, R. H.
**Flood-fallowing for eradication of *Fusarium oxysporum* f. *cubense*: II. Some factors involved in fungus survival.**
*Soil Sci.*, 1954, 77: 401-14, bibl. 15.

The length of survival of *Fusarium oxysporum* f. *cubense* in soils submerged under 1½ to 3 feet of water in flood fallowed lakes varied from 25 to 80 days. In laboratory tests temperature profoundly affected *Fusarium* survival in submerged soils, but the type of soil had no consistent effect, and among various nitrogen compounds added only cyanamide at 2,000 or more pounds per acre reduced the period of survival. Under anaerobic conditions *Fusarium* did not survive 14 weeks in any field soil tested. The maximum length of survival in saturated soil under anaerobic conditions was 6 weeks and at least 7 weeks in soil 50% saturated. Aeration of submerged soils by flowing water increased survival.—United Fruit Co., La Lima, Honduras. [See also *H.A.*, 23: 2231 and 24: 851 and 1017r.]

4283. Singh, K. K., and Mathur, P. B.
**Cold storage of Cavendish variety of banana.**
*Bull. centr. Food Tech. Res. Inst. Mysore*, 1953, **2**: 307, from abstr. in *Food Sci. Abstr.*, 1954, **26**, No. 1886.

Physiological loss of weight by Indian-grown Cavendish bananas was least at 52° to 55° F. The bananas developed low-temperature injury after 12 days at 47° to 50° F. and after 6 days at 42° to 45° F., if stored at the yellow-green stage, or 10 days if stored at the hard green stage. At all temperatures above 52° F., the bananas ripened normally; the ripening period decreased with increasing temperature. A temperature of 52° to 55° F. and relative humidity of 85% to 90% are recommended as the optimum conditions for the cold storage of Cavendish bananas. The approximate storage life of bananas picked at the hard green stage is then 22 days.

4284. Board, P. W., and Seale, P. E.
**Canning bananas.**
*Food pres. Quart.*, 1954, **14**: 2-3, bibl. 1.

The belief that bananas could not be canned successfully has been disproved. A method is described which is based on acidification of the syrup to reduce the pH of the pack to 4·2–4·3. The varieties Cavendish and Mons Marie have proved satisfactory for canning, whereas Ladies' Finger is entirely unsuitable.—C.S.I.R.O., Homebush, N.S.W.

## *Cacao.*

(*See also* 4446a.)

4285. Martinez, A., and Noël James, C.
Cacao: bibliografía de las publicaciones que se encuentran en la Biblioteca del Instituto. **(Cacao: bibliography of publications in the [Interamerican] Institute library.)**
*List. bibl. Inst. interamer. Cien. agric. Turrialba* **2,** 1954, pp. 258.

This cyclostyled bibliography of the cacao publications to be found in the Orton Commemorative Library at the Interamerican Institute of Agricultural Sciences, Turrialba, Costa Rica, contains 1,748 references. It is divided into 12 parts: (*1*) general bibliographies (7 references); (*2*) economics (43); (*3*) cacao growing (496)—general (82), Central America and Mexico (46), the Antilles (75), South America (146), Africa (100), Asia and Oceania (47); (*4*) cultural practices (228)—general, propagation, soils, fertilizers, pruning, shade and shade trees, yield; (*5*) fungal and virus diseases (254); (*6*) insect and other pests (137); (*7*) the cacao tree (245)—taxonomy, varieties, breeding and selection, morphology, physiology; (*8*) processing (178); (*9*) uses and by-products (23); (*10*) research and administration (99); (*11*) technical conferences (12); and (*12*) papers presented at the Vth Interamerican Cacao Conference 1954 (26). There is an author index.

4286. Urquhart, D. H., and Ross Wood, G. A.
**The cocoa industry in Nigeria, the British Cameroons and the French Cameroons.**
*World Crops*, 1954, **6**: 267-71, 325-9, 375-8, illus.

*Nigeria.* Cacao represents about a third of the value of all exports. The industry is menaced by virus disease and suffers heavy annual losses from black pod and capsid. The cacao is mainly grown in the Western Region where extensive areas are available for expansion. The Ikom area in the Eastern Region offers possibilities for further expansion. Soil surveys are well advanced and demonstration plantations are being established. An appendix deals with control of black pod by spraying with bordeaux mixture. *British Cameroons.* Cacao is of far higher value per ton than any other crop exported. The sparsely populated Mamfe and Kumba Divisions are the important areas. Much land is available for expansion, but development of the territory depends on an improved road system. There are no pests or diseases of major economic importance other than black pod. *French Cameroons.* The cacao industry is being actively developed. Some 300,000 acres of good land in the south have been planted and much remains available. Production is to be stepped up by control of pests and diseases, better cultural practices and the use of high-yielding planting material. The problem of smoky cacao due to the practice of storing beans in the producers' houses in both British and French Cameroons is being overcome.

4287. García Becerra, C.
Las investigaciones en cacao. **(Cacao research.)**
*Cacao en Colomb.*, 1953, **2**: 3-16, bibl. 47.

A brief summary is given of the cacao research conducted to date at the Palmira Agricultural Experiment Station. Subjects include selection, vegetative propagation, physiology, fertilization and fruiting, diseases and pests, weeds and herbicides.

4288. Burle, L.
La sélection du cacaoyer. Son orientation en Côte d'Ivoire. **(Aims in cacao selection in the Ivory Coast.)**
*Bull. Centre Rech. agron. Bingerville*, 1953, **8**: 3-90, bibl. 88, illus.

The following aspects are considered in this bulletin: Present position of cacao culture in the world (pp. 4). Selection (pp. 20): species, world production, resistance to disease, methods of selection. Practical results (pp. 16): Ivory Coast and other parts of the world (pp. 8). Vegetative multiplication of selected clones (pp. 2). The aims of research in the Ivory Coast are the production of varieties giving a high yield of average quality cacao resistant to swollen shoot disease and tolerant to capsid attack.

4289. de Greeff, H. J.
Proefaanplantingen van cacao op Noord-Celebes. **(Experimental cacao plantations in North Celebes.)**
*Bergcultures*, 1954, **23**: 331-5.

In 1940 cacao was planted out between 2-year-old coconut trees and those that survived the war are still doing well, giving an average of 110 pods per tree. In 1947 further plantings were made of cacao alone, and cacao under young and old coconut trees. The plantation under old coconut trees did not make satisfactory growth. Five-year-old trees growing alone yielded 560 kg. per ha. of cacao, trees mixed with young coconuts gave 690 kg. per ha., although this difference is probably due to soil. The soils, aspect and climate of the experimental plantations are described.

4290. FRANCK, J.-P.
Le bouturage du cacaoyer. (**Propagating cacao by cuttings.**)
*Bull. Centre Rech. agron. Bingerville*, No. 5, reprinted in *Bull. Agric. Congo belge*, 1954, **45**: 771-5.

This full account of the methods used in the Ivory Coast covers choice of wood, preparation of 4-budded, 3- to 4-leafed cuttings, treatment with beta indoleacetic acid, rooting in sand in concrete propagators shaded to 50% light, and transfer to baskets after 3 weeks.

4291. (ALVIM, P. DE T., AND DUARTE, O.)
**Hormone-fungicide mixtures for rooting cacao cuttings.**
*Cacao*, 1954, 3 (2): 3.

Hormone-fungicide and other mixtures in liquid and powder form were tested at the Inter-American Cacao Centre, Turrialba, Costa Rica. The best were found to be 8,000 p.p.m. of indolebutyric acid in either talc plus phygon at 3: 1 or talc plus orthocide 50 at 3: 1. Both gave highly significant increases in the percentage of rooted cuttings compared with any of the treatments previously recommended.

4292. CAMACHO MORALES, L. H.
Conservación de yemas para injertos en cacao. (**Storage of cacao budwood.**) [English summary 15 lines.]
*Cacao en Colomb.*, 1953, **2**: 91-102, bibl. 7.

Budwood of 1–2 cm. diameter of the Angoleta clone 6 was stored experimentally in damp decomposed sawdust, damp vegetable charcoal powder, damp sand and other materials easily available on a plantation. Charcoal gave the best results, permitting storage for a week. None of the other materials permitted more than 2 days' storage, but budwood could be stored overnight in sawdust, sand or damp cloth. It became difficult to detach the buds from the shoots after 6 days' storage. Discoloration of the bud tissue increased and rate of sprouting and growth decreased with increased length of storage. Experimental data are given.

4293. GARCÍA B[ECERRA], C., AND NAUNDORF, G.
Algunos apuntes para el transplante de estacas de cacao. Primera nota. (**Some notes on transplanting cacao cuttings.**)
*Cacao en Colomb.*, 1953, **2**: 17-20, bibl. 2.

In Colombia cacao cuttings often show a check in growth lasting up to a year after planting out or grow without producing laterals. Experiments showed that the removal, or at least opening at the base, of the basket before planting out greatly reduced deaths and greatly increased chupon growth, and that removal of the terminal bud some weeks after planting out stimulated the production of laterals. Experimental data are given.

4294. VAN DER KNAAP, W. P.
Onderstaminvloed op de groei van jonge cacao-zaailingen. (**Rootstock influence on the growth of young cacao seedlings.**) [English and Indonesian summaries 13 and 16 lines respectively.]
*Bergcultures*, 1954, **23**: 387-91.

Studies were made on young cacao plants before and after budding to determine the effect of stock and manuring on scion growth. The results obtained were unsatisfactory but indicated that the stock and its treatment before budding had little effect on subsequent scion growth.

4295. HAVORD, G., WASOWICZ, T. E., AND WHITE, R. G.
**Aggregate stability in a clay soil in relation to cacao cultivation.**
*Trop. Agriculture Trin.*, 1954, **31**: 233-41, bibl. 7, illus.

A pot experiment is described in which cacao seedlings of known parentage were grown for 9 months in various sized aggregates of a silty-clay soil, common in Trinidad. Stem and root growth was significantly greater in pots with 2 to 4 mm. and 4 to 12 mm. aggregates than in those with aggregates less than 1 mm., and the stem/root ratio was lower with large aggregates than with small. Root growth was strong and vigorous in the large aggregate soils, while roots in the small aggregates were spindly and unable to penetrate the soil. Although plant nutrient uptake in small-aggregate soils was low, it probably resulted in slower growth rather than in any actual deficiency. Even after 9 months of daily watering the larger aggregates showed little structural deterioration. In a small field experiment on such soils in Trinidad 4 soil management methods were compared, namely, control with only hand-weeding, mulching, mulching with fertilizers, and hand-forking during the dry season. The only treatment to show any increased growth was the forking.

4296. MADERO BERNAL, A.
Un nueva sistema de abonamiento en el cultivo del cacao. (**A new method of manuring cacao.**) [English summary ½ p.]
*Cacao en Colomb.*, 1953, **2**: 77-89, bibl. 39.

Four different foliar spray treatments were compared with surface application of Knop's solution in experiments on Amelonado seedlings grown in sand culture. Knop's solution and urea plus potassium glycerophosphate produced normal growth and almost identical weights of dry matter per plot, namely, 482 and 481 g. respectively. Urea alone and potassium glycerophosphate alone produced only 286 and 267 g. respectively, while calcium glycerophosphate alone (221 g.) was little better than the untreated control (215 g.). Foliar nutrition is recommended as an economical alternative to soil fertilization.

4297. MANJARRÉS CASTAÑEDA, E.
Influencia de las aspersiones foliares con fertilizantes sobre la fructificación del cacao. (**Effect of foliar nutrition on fruit set in cacao.**) [English summary 13 lines.]
*Cacao en Colomb.*, 1953, **2**: 167-82, bibl. 17.

Glycerophosphates of calcium and of potassium, urea, potassium chlorate and phosphoric acid were applied to unpollinated, naturally pollinated, and artificially pollinated flowers of the self-fertile Palmira clones 5 and 6. Except in isolated cases, all materials gave a higher percentage fruit set after 14 days than occurred in the controls. The increase was greatest in artificially pollinated flowers and the maximum, almost double that in the controls, was given by 1% urea.

4298. Jaramillo A., R.
La urea y el marchitamiento de los frutos jovenes de cacao. (**Urea and cherelle wilt.**) [English and German summaries 11 and 13 lines.]
*Cacao en Colomb.*, 1953, **2**: 63-76, bibl. 58.

In trials at Palmira on 12-year-old trees of the Angoleta and Cundeamor subtypes of the Trinitario complex spraying with urea at concentrations of 10 and 5 g. per l. and at the rate of 2 gal. per tree reduced cherelle wilt from 32% to 12–14%. A commercial mixture of parachlorophenoxyacetic acid and alphanaphthalene-acetic acid reduced it to 9·6%. [See also *H.A.*, 24: 3133.]

4299. Bartolome, R.
**A study on the effect of fertilizer application on the incidence of cherelle wilt on cacao.** [Spanish summary ¾ p.]
*Philipp. J. Agric.*, 1954, **17**: 55-88, bibl. 25, illus.

In experiments at La Lola, Costa Rica, in 1950 the incidence of cherelle wilt (1) was unaffected by application of NPK, (2) was not significantly correlated with the number of fruits per tree, (3) was reduced by spraying with bordeaux mixture, and (4) showed a significant positive correlation with the number of rainy days (with 0·25 in. or more of rain) during the week immediately preceding the date of observation. Cherelle wilt at La Lola is thought to be mainly due to tree hoppers and fungal infection. A membracid hopper is associated with it, and young fruits that survive infestation show reduced rate of growth.

4300. van der Knaap, W. P.
Kruisbestuiving van cacaobloemen. (**Cross-pollination of cacao flowers.**) [English and Indonesian summaries 10 and 13 lines respectively.]
*Bergcultures*, 1954, **23**: 359-61.

Examination of 5 trunk pods from a tree of the white-seeded, self-compatible clone DR38 showed that 3 of the pods contained only white beans, indicating that self-pollination had occurred. The other 2 pods contained 42% and 53% purple beans which suggested that some cross-pollination had taken place with pollen from 2 adjacent purple-seeded, self-sterile clones DR1 and G8. Pods which grew higher up in the trees contained no purple beans, and it is suggested that this may be due to the leaf canopy hindering movement by the pollinating midge, *Forcipomyia* sp., between the upper flowers on neighbouring trees.

4301. Salcedo V., D.
Acción de la hidracina maleica sobre la flor de cacao. (**Effect of maleic hydrazide on the cacao flower.**) [English summary ½ p.]
*Cacao en Colomb.*, 1953, **2**: 27-39, bibl. 27.

In experiments with Palmira clone 6, maleic hydrazide was applied to the abscission zones and stigmas of artificially and open-pollinated flowers. It acted as an antiauxin, having no effect on the open-pollinated flowers, in which there had been no special production of auxin, but causing drop of the majority of the artificially pollinated flowers, i.e. those in which there had been an increase in auxin concentration.

4302. Restrepo P., H.
Frutos partenocarpicos en cacao. (**Parthenocarpy in cacao.**) [English summary ½ p.]
*Cacao en Colomb.*, 1953, **2**: 155-61, bibl. 7, illus.

The production of seedless cacao pods is increasing, is common to all the best selected Palmira clones, especially clones 3 and 6, and may become a serious problem. Experiments on the artificial production of parthenocarpic fruits were made on clones 3 and 6 with a view to determining the natural causes. Growth substances, fungicides, insecticides, powders—such as talc, wheat flour, activated charcoal and fine soil—and the pollen of other plants were applied by spraying, dusting or directly to the stigmas. None of these materials induced parthenocarpy and the phenomenon is thought to be either due to degeneration or of genetic origin.

4303. Cardona, E.
Influencia de siete insecticidas en la polinización y la fructificación del cacao, y breve estudio de los insectos polinizadores. (**The effect of 7 insecticides on pollination and fruit set in cacao, with short notes on the pollinating insects.**) [English summary ½ p.]
*Cacao en Colomb.*, 1953, **2**: 41-61, bibl. 5.

More or less complete flower drop was caused by all the insecticidal sprays tested except BHC and dieldrin which may be used at normal concentrations. In the case of dieldrin, for example, the percentages of unsprayed flowers, of flowers sprayed before, and of flowers sprayed after, artificial pollination which remained on the tree 6 days later, were approximately 34, 24 and 20 respectively. Possible pollinators are named.

4304. Tinsley, T. W., and Usher, G.
**A colour test for detecting swollen shoot disease in Gold Coast cacao.**
*Nature*, 1954, **174**: 87, bibl. 2.

The Lindner method [*H.A.*, 21: 1449] failed. A description is given of a modified technique using expressed leaf sap, which has been successful.—W. Afr. Cacao Res. Inst., Tafo, Gold Coast.

4305. Orellana, R. G.
Estudios sobre la podredumbre de la fruta del cacao causada por *Phytophthora* en Costa Rica. (**Investigations on cacao black pod disease (*Phytophthora palmivora*) in Costa Rica.**) [English summary 26 lines.]
*Turrialba*, 1954, **4**: 35-8, bibl. 7, illus.

An account is given of control experiments begun at La Lola in 1950 and 1952. (1) Bordeaux mixture at 30- and 60-day intervals gave better control than SR406, SR50 or Dithane Z-78 at 30-day intervals. There was no significant difference between the yields in the first 2 years, but in the 3rd year higher yields were given by Dithane, perhaps due to the effect of its zinc, and by bordeaux. (2) Dithane at 7- and 14-day intervals gave almost as good control as bordeaux at 30-day intervals. Experiments with other fungicides and on spray schedules began in 1953. [See also *H.A.*, 24: 1958.]

4306. WADSWORTH, R. V., AND HOWAT, G. R.
**Cocoa fermentation.**
*Nature*, 1954, **174**: 392-4, bibl. 5.

Two methods of fermenting very small quantities of cacao beans are described, both of which have produced beans which, after drying, roasting and shelling, have a good chocolate flavour. In the first method the fresh beans were sprayed with a mixed culture of a yeast, *Hansenula anomala*, and an acetic acid producing organism, *Bacillus orleanense*; temperatures were kept below 38° C. for 3½ days and then at 50–51° C. for 3 days. The second method involved the use of "aseptic fermentations", the fresh beans being sprayed with a solution containing quarternary ammonium to prevent the growth of organisms and then held at controlled temperatures in a water-bath or incubator; an essential feature during the early, low temperature phase is the removal of $CO_2$ by one or other of two methods. Other aspects of fermentation studied include (1) germination processes during the first part of fermentation, (2) the optimum temperature to be maintained for several days after the initial germination period, and (3) the removal of $CO_2$ from the air around the fermenting beans. A fuller account of the work is to be published elsewhere.

4307. SCHREUDER, W. H. E., AND SPOON, W.
Schimmelaantasting van cacaobonen. **(Cacao bean moulds.)** [English summary 1½ pp.]
*Cacao-Choc.-Suikerw.*, 1954, **22**: 115, reprinted as *Ber. Afd. trop. Prod. kon. Inst. Trop.* **243**, 1954, pp. 8, bibl. 1.

This article summarizes a paper by R. Renaud (*Bull. Centr. Rech. agron. Bingerville*, 1953, 7: 45-64) and discusses his results in the light of the authors' investigations in Holland. The 3 most serious moulds are *Mucor buntingii*, *Aspergillus glaucus* and *A. fumigatus*. *A. glaucus* likes a low moisture content for its development. *A. fumigatus* and *M. buntingii* have their optimal development at those temperatures most satisfactory for bean fermentation. Mould attacks can largely be prevented by such measures as the removal of damaged pods, careful fermentation with protection against rain and cooling, quick drying, artificially if necessary, and keeping the humidity of storage rooms below 82%.

4308. MILLER M., R.
Preparación de compost en cacaotales. **(Composting in cacao plantations.)**
*Cacao en Colomb.*, 1953, **2**: 163-6, bibl. 2.

Krilium, unspecified bacteria, NPK and ammonium sulphate reduced the decomposition period of organic matter such as cacao husks, diseased pods and weeds from 195 days to 120, 130, 150 and 150 days respectively. All produced good compost.

### *Cinchona.*

4309. SWAMY, A. Y.
**Cinchona industry in the Madras State.**
*Horticultural and Economic Plants of the Nilgiris*, reprinted in *Plant. Chron.*, 1954, **49**: 123-8.

Following a short historical review the author describes the activities of the Madras Cinchona Department, of which he is the Director. A research section was established in 1942 with headquarters at Anamallais. Progress in methods of vegetative propagation has been particularly encouraging and clonal material is now being raised successfully by patch budding and from cuttings and layers. Other cultural methods are described briefly.

4310. FOUCART, G.
Le sphinx de quinquina, *Celerio nerii* L. **(The cinchona sphingid moth, *Celerio nerii*.)**
*Bull. Inf. INEAC*, 1954, **3**: 111-22, illus.

Biological notes are given on this pest which was of minor importance in Kivu until 1952/53 when it caused serious damage. The caterpillars attack the leaves, leaf buds and even the tips of green shoots, particularly of young plants and suckers. Control is effected by collection of the caterpillars from the trees and of chrysalises from the superficial layers of the soil, and by spraying the trees with Solvexane 50 B (BHC) and dusting with BHC plus DDT. Both these insecticides destroy caterpillars of all ages.

### *Cloves.*

(*See also* 4270.)

4311. FRAPPA, C.
Sur une chenille de Thyrididae du genre *Chrysotypus* nuisible au giroflier sur la côte est de Madagascar. **(On a thyridid caterpillar of the genus *Chrysotypus* destructive to the clove tree on the east coast of Madagascar.)**
*Bull. Madagascar*, 1954, No. 95, pp. 348-57, bibl. 7, illus.

Clove plantations suffered severely in the past from these caterpillars which tunnel in the shoots and branches and cause dieback. Attack was widespread, incidence reached 80% and up to half of the anticipated harvest was lost. In 1941 systemic control by collection of adults, pupae and caterpillars began. Success was achieved and by 1944 it was possible to lift the official control, although the pest had not completely disappeared.

### *Coconuts.*

(*See also* 4447c, d.)

4312. FRÉMOND, Y.
La culture du cocotier au Togo. **(Coconut growing in Togo.)**
*Oléagineux*, 1954, **9**: 421-5, illus.

Extensive natural and planted coconut groves exist in Togo. Yields of copra average 0·9 tons per ha., and exports are about 2,500 tons per annum. Native methods of grove management are described.

4313. ZUÑIGA, L. C.
**The probable inheritance of the makapuno character of coconut.**
*Philipp. Agric.*, 1953, **36**: 402-8, bibl. 5, illus.

The makapuno coconut has a soft but firm endosperm almost filling the nut and a thick viscous milk and is much prized for fresh consumption in the Philippines. Notes are given on crossing experiments.

4314. Davis, T. A., Anandan, A. P., and Menon, K. P. V.
**Injection in coconut palms for curative purposes. I. Methods of injection.**
*Indian Coconut J.*, 1954, **7**: 49-60, bibl. 25, illus.

Experiments on the injection of coconut palms were begun at the Central Coconut Research Station, Kayangulam, in 1949. Solid injections were harmful. The best method of liquid injection was found to be through the cut ends of mature functioning roots. The method is described.

4315. Rao, H. K. S.
**Watering coconut seedlings in summer.**
*Bull. Indian centr. Coconut Cttee*, 1954, **7**: 247, illus.

A note is given on an economical method of pot watering of coconut seedlings. An earthenware pot, capable of holding 1 to 2 gal. of water, is buried up to its neck, close to the seedling in the pit; the pots are then filled and covered with a lid. The water lasts for 1½ to 2 months.

4316. Wijewardene, R.
**Mechanisation on a coconut estate.**
*Ceylon Coconut Quart.*, 1953, **4**: 143-51, illus., and reprinted in *Indian Coconut J.*, 1954, **7**: 77-81.

Methods and economics of mechanization are discussed, with reference to manuring, cultivation, collection and transport of nuts, hole digging and contour ridging.

4317. Gangolly, S. R., and Chathukutty Nambiar, M.
**Studies on the occurrence of barren nuts in the coconut (*Cocos nucifera* L.). 1. Importance, morphological features and frequency in incidence.**
*Indian Coconut J.*, 1953, **7**: 5-19, bibl. 48, illus.

This is the first of a series of papers on barren nuts in the coconut, a phenomenon which is estimated to be responsible for a 3% loss in India's total annual yield and which has been under investigation at the Central Coconut Research Station, Kasaragod, since 1942. Notes are given on morphological features and on the incidence in different years, at different seasons of the year, and in different types.

4318. Narayanan, E. S.
**Insect pests of the coconut palm and their control.**
*Indian Fmg*, 1954, **4** (2): 8-13, illus.

An account is given of the damage caused by, and the biology and control of, 3 major coconut pests in India, namely, the rhinoceros beetle (*Oryctes rhinoceros*), the red palm weevil (*Rhynchophorus ferrugineus*), and the black-headed caterpillar (*Nephantis serinopa*). Brief notes are given on 16 minor pests.

4319. Brown, E. S.
**The biology of the coconut pest *Melittomma insulare* (Col., Lymexylonidae), and its control in the Seychelles.**
*Bull. ent. Res.*, 1954, **45**: 1-66, bibl. 55, illus.

This paper includes an account of experiments with synthetic and other insecticides. In shallow infestations the surface wood is shaved off the infested area, thus opening all tunnels and leaving a slight hollow to which the insecticide is applied. Coconut husks are then packed tightly over the whole infested area and earth is piled over and round the husks to a thickness of at least a foot. The insecticide vaporizes in the cavity thus formed and slowly diffuses into the tunnels. The procedure is the same in the case of deep infestations except that all rotted (as distinct from fermented) wood must be gouged away and a deep hollow is thus formed. In large-scale experiments PDB gave the best results, namely, 100% larval mortality in 68% of the treated palms, and was followed by aldrex (59%). Recommendations are made for supplementary cultural control measures.

4320. Way, M. J.
**Studies of the life history and ecology of the ant, *Oecophylla longinoda* Latreille.**
*Bull. ent. Res.*, 1954, **45**: 93-112, bibl. 37, illus.

From the studies described the author concludes that *Oecophylla longinoda* is of undoubted value for controlling certain coconut pests, notably the coreid bug *Theraptus* sp., and that its efficiency in coconut plantations could probably be much enhanced.

4321. Nirula, K. K., Antony, J., and Menon, K. P. V.
**Some investigations on the control of termites.**
*Indian Coconut J.*, 1953, **7**: 26-34, bibl. 33.

Laboratory trials using dry soil treated with organic insecticides were carried out during 1951 and 1952. Outstanding toxicity but low persistence was exhibited by parathion in very weak concentrations. Pentachlorophenol and sodium pentachlorophenate were also quite effective. Benzene hexachloride showed rapid and complete toxicity to the termites in the first trials, when it was mixed freshly, but in subsequent experiments its residual toxicity was found to decline slightly. Toxaphene showed fair residual toxicity, but was not so toxic as BHC. Chlordane also proved quite effective, and its toxicity was persistent throughout the trials. DDT and DDD were insecticidally active against the termites in the treated soil, but their reaction was quite slow. [From authors' summary.]—Centr. Coconut Res. Stat., Kayangulam.

### *Coffee.*

(*See also* 3676, 4446f, r, u, 4447i, s, t, 4469.)

4322. U.S. Department of Agriculture, Foreign Agricultural Service.
**Information relating to the current world coffee situation.**
*Foreign Agric. Circ.* **FCB 3-54**, 1954, pp. 58.

The 1953/54 world coffee yield is estimated at slightly below the 1952/53 yield and supply difficulties are forecast for 1954/55 owing to the July 1953 frost in Brazil and to the dwindling of carry-over surpluses as the result of distribution having exceeded consumption since the war. Statistics are presented on supply, distribution, exports and imports of green coffee from the 5-year period ending 1939/40 to date. Notes are given on the July 1953 frost and harvest prospects in North Paraná, Brazil.

4323. U.S. Department of Agriculture, Foreign Agricultural Service.
**Point 4 Coffee Mission.**
*Foreign agric. Circs* **FCB 6-53**, 1953, pp. 6 (Kenya), **7-53,** 1953, pp. 8 (India), **8-53,** 1953, pp. 2 (Ceylon), **11-53,** 1953, pp. 3 (Malaya), **12-53,** 1953, pp. 4 (Java), **13-53,** 1953, pp. 3 (Philippines), **14-53,** 1953, pp. 4 (Hawaii).

Short accounts are given of things noted in countries visited by Dr. F. L. Wellman and Dr. W. H. Cowgill in the course of a world trip, the main object of which was the study of coffee diseases and in particular *Hemileia vastatrix*. Methods of cultivation used are noted in each country visited. [See also *H.A.*, 24: 1994.]

4324. Tanganyika (Sanders, F. R.).
*Nineteenth Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi, 1952,* 1954, Dar Es Salaam, pp. 36, Shs. 1/75.

*Improvement of planting material.* Clonal and seedling selection trials continued. *Improvement of growing conditions.* Results of the mulch/compost/nitrogen experiment planted in 1940 confirmed the findings of previous years, namely, that only compost has significantly increased the yield over the period. In the pruning method experiment planted in 1935 single-stem outyielded multiple-stem during the year but the mean annual yield over the 15-year period is still in favour of multiple-stem by 30%. In the time of pruning experiment planted in 1936 the effect of early pruning is very marked, the yields from pruning one month after harvest being significantly higher than those from plots pruned 5 and 6 months later. Observations suggest that pruning immediately after crop induces a greater degree of flowering.

4325. Borget, M., and Drouillon, R.
Le caféier "de la Nana", sa place systématique et sa culture particulière. (**The taxonomy and culture of Nana coffee.**)
*Agron. trop.*, 1954, **9**: 183-96, bibl. 12, illus.

Nana coffee, which is considered to be a variety of robusta, is grown in a restricted area on the Nana river in the French Cameroons. Its annual yield of saleable coffee is 360 kg. per ha. compared with 430 kg. for robusta.

4326. Graner, E. A.
Café: viveiros, semeação e transplantação. (**Coffee: nurseries, sowing, transplanting.**)
*Rev. Agric. Piracicaba*, 1954, **29**: 169-74.

Brazilian practice is briefly described. *Nurseries:* natural (in forest clearings) and artificial. *Sowing:* Dry depulped seeds are sown 3–5 cm. apart in lines 15 cm. apart in prepared, shaded beds, which are then straw-mulched. Sowing is done in April/May (the end of the rains) or in September/October. *Transplanting:* Plants sown in April/May are transferred to boxes in September/October and planted out in December/January. Plants sown in September/October are boxed in April/May and planted out at the beginning of the rains. The boxes contain 3–4 plants. *Stumped plants* are used for filling gaps and in hilly places where the carriage of boxes is difficult. They are 2 years old, are cut 20 cm. above and below the collar and are best planted out at the end of the rains.

4327. Vallaeys, G.
Progrès réalisés dans la sélection et la culture du caféier robusta in 1953. (**Progress made in the selection and culture of robusta coffee in 1953.**)
*Bull. Inf. INEAC*, 1954, **3**: 129-40, bibl. 1, illus.

*Propagation by cuttings.* Large-scale propagation of cuttings during the year has led to the following modifications of the method previously outlined [*H.A.*, 23: 1271]: (1) The rooting medium now used is decomposing sawdust; (2) reduction of the leaf area of the cutting by half permits closer spacing in the rooting bed without lowering percentage success; (3) longitudinal splitting of whole shoots to make two cuttings doubles output; (4) propagator frames are now commonly dispensed with; (5) IBA plus NAA gave better root systems than IBA alone but neither faster rooting nor greater percentage success; (6) increase of cut surface area by bevelling the base of unsplit cuttings or splitting them longitudinally from the base for the greater part of their length, i.e. increasing the scar area, stimulated rooting; (7) the method of preparing unrooted cuttings for long journeys is described; (8) dipping in bordeaux mixture for 3 hours before placing in the rooting bed minimizes leaf fall. *Shade Trees. Terminalia superba, Macaranga monandra, Croton mubango, Phialodiscus discoideus* and *Hevea brasiliensis* are the best; experimental notes are given. *Preselection in the field.* An account is given of 2 experiments in dense sowing and planting followed by early thinning of weak plants. *Progeny yield trials.* L.147 is the highest-yielding of a number of promising varieties listed.

4328. Carré, J.
Le caféier. Essais de multiplication par greffage. (**Coffee grafting tests.**)
*C.R. Rech. agron. Madagascar 1953*, No. 2, pp. 108-11, bibl. 5, illus.

A machine, made in France, for mechanical grafting is described [see *H.A.*, 24: 1982]. In tests with coffee in Madagascar the best results were obtained from grafting done during the dry season (June to October), after the scions had been dipped in paraffin. The average daily output was 300 grafted trees, with an 80% take. Other methods of grafting are discussed.

4329. Cowgill, W. H.
**Try growing coffee in sun-hedges for quicker and greater yields.**
[*Publ.*] *Inst. agropec. nac. Guatemala*, 1954, pp. 4, illus.

Sun-hedges, now being experimented with at the Chocolá sub-station, give area yields 5–8 times greater than normally spaced, shaded coffee and are economical to establish and maintain. Bourbon gives much better results than typica. The hedges are planted 3–4 m. apart along the contour and consist of 1–3 rows of bushes 1 m. apart, the broader hedges being used on the more gentle slopes. Temporary shade crops such as *Crotalaria* or *Cajanus* are sown in the inter-hedge strips before the coffee is planted and are used as mulch round the coffee in its first dry season. Permanent shade crops such as *Indigofera endecaphylla* or *Desmodium ovalifolium* are established later. Pruning is kept to a minimum and generally takes place only in 3-row hedges. Advantages of sun-hedges are no expenditure on weeding, ease of harvesting and maintenance of output through the planting of new hedges in the inter-hedge spaces as soon as the yield of the original hedges begins to fall.

4330. Navarrete S., C.
Cenizas totales y algunos constituyentes carbohidratados, y nitrogenados de las raices de cafetos en fructificación y sin frutos a traves de la estación. **(Total ash and certain carbohydrate and nitrogenous constituents of coffee roots at different seasons.)**
*Bol. inf. Colombia*, 1954, **5** (51): 22-31, bibl. 18.

A study of the composition of coffee roots at different seasons was made at Turrialba in 1950/51. The chief results were: (1) there is a fall in the content of all forms of nitrogen and of carbohydrates during dormancy; (2) the ash contents of the leaves and of the roots appear to be inversely related; (3) a positive relationship appears to exist between reducing sugars content and growth of the aerial parts. The chief conclusions drawn were: (1) the fall in nitrogen and total ash percentage during dormancy correlated with the very low reducing sugars content at that season suggests that deficiency in reducing sugars inhibits salts accumulation in the roots; (2) a high sucrose content probably inhibits starch hydrolysis; (3) acid-hydrolysable carbohydrates do not constitute a good reserve of carbohydrates but starch does, and this factor may be the cause of biennial bearing; (4) fruiting probably causes a considerable fall in starch reserves and in total carbohydrates content of the roots at the season of maximum growth.

4331. Loue, A.
Étude de la nutrition du caféier par la méthode du diagnostic foliaire. **(A study of coffee nutrition based on leaf analysis.)**
*Bull. Centre Rech. agron. Bingerville*, 1953, **8**: 97-156, bibl. 24.

A detailed account is given of nutritional studies on robusta coffee at Akandje Station in the Ivory Coast in 1950/52. These showed that (1) the binary formulations NP, NK and PK are not to be recommended and that robusta requires a complete fertilizer; (2) at least 2 formulations are desirable, one for use during the first 3 years after planting out, in which N predominates and reaches 30 g. per tree in the third year, and another for subsequent use in which K predominates; (3) a watch should be kept for Ca deficiency as Ivory Coast soils are poor in this element; (4) at least 2 fertilizer applications should be made per annum and preferably 3 as follows: April/May $\frac{2}{5}$ N, $\frac{5}{5}$ $P_2O_5$ and $\frac{2}{5}$ $K_2O$, mid-July $\frac{1}{5}$ N, and early October $\frac{2}{5}$ N, $\frac{3}{5}$ $K_2O$. The recommended form of N is sulphate of ammonia, of P bicalcium phosphate, and of K either chloride or sulphate. Suitable commercial compound fertilizer formulas are 12-12-20, 10-10-20, 10-10-15, 13-10-15. The rates for the 12-12-20 formula, for example, should be 50–75 g. per tree in the first year, 75–100 in the second, 100–150 in the third, 300 in the fourth and 300–500 in the fifth.

4332. Scaranari, H. J., and Inforzato, R.
Sistema radicular das principais leguminosas empregadas como adubo verde em cafèzal. **(The root systems of the leguminous plants most commonly used as green manures in coffee plantations.)** [English summary 9 lines.]
*Bragantia*, 1952, **12**: 291-6, bibl. 7, illus.

Of the 4 plants studied *Crotalaria juncea* had the deepest roots followed by *Canavalia ensiformis* and then by soya and *Mucuna* sp. Root depth was related to height of plant. The roots of these plants occupied the same soil horizons as those of the coffee, namely, the upper 30 cm.—Inst. agron. Campanis.

4333. Robertson, J. K.
***Acacia* spp. as shade trees for coffee.**
*E. Afr. agric. J.*, 1954, **19**: 272.

*Albizzia maranguensis* and *Cordia holstii* are generally regarded as being the 2 best coffee shade trees in the Northern Province of Tanganyika. *Acacia sieberiana* gives good results in the Tengeru/Usa River area (51 in. rainfall) of this Province. In the Southern Highlands Province *A. albida* gives good results in certain areas with a rainfall of 50–60 in. and *A. spirocarpa* in other unspecified areas.

4334. Blasingame, R. U., and Eschenwald, A.
**New coffee scrubber and washer.**
*Agric. Engng St. Joseph, Mich.*, 1954, **35**: 326, illus.

A short account is given of a simple machine developed in Puerto Rico for removing the lees from coffee beans. It is claimed that as a result of eliminating fermentation, time, labour and water are saved, the lees, rich in pectins, could be used in industry, and beans of better appearance are obtained.

4335. Ferraz, M. de B., and Veiga, A. de A.
Secagem racional do café. **(Controlled drying of coffee.)**
*Bol. Super. Serv. Café, S. Paulo*, 1954, **29** (325): 5-16, bibl. 7, illus.

Arabica, red and yellow bourbon, maragogipe and caturra coffees were dried in a special dryer at 3 different stages of maturity, namely green, mature and over-mature. Temperatures were either maintained constant at points between 35° and 80° C. or were raised or lowered during drying. The results and conclusions were: (1) temperature governs liquoring quality, that in the early stages of drying being the most important; (2) rapid drying prevents alterations due to contamination; (3) constant temperatures of 50–55° C. lowered liquor quality except in maragogipe; (4) green berries gave the best liquor and had the best colour when dried at 65–75° C.; (5) newly harvested mature berries gave the best liquor; (6) having regard to the importance of temperature, only controlled drying in suitable apparatus can ensure the production of fine coffees.—Inst. agron., Campinas.

4336. Narayanaiyer, S., and Ramachandran, K.
**Chemical standards for coffee powder.**
*Curr. Sci.*, 1954, **23**: 192, bibl. 2.

With a view to fixing chemical standards for coffee powder several samples of arabica and robusta seeds were roasted, powdered and analysed for water extract, alkalinity of ash, caffeine and fat. The caffeine content of robusta samples ranged from 2·03 to 2·40% and that from arabica samples from 1·30 to 1·45%. The fat content of arabica ranged from 11·5 to 15·7%, whereas that of robusta was only 7·2 to 9·0%.

4337. Abrahão, T.
"Estrangulamento" da haste do cafeeiro. **(Girdling of the trunk in the coffee bush.)**
*Biológico*, 1954, **20**: 32-6, bibl. 2, illus.

Many cases of girdling of the stem just below the base of the crown were reported in coffee trees of 1–4 years old in São Paulo State, Brazil, at the end of 1953. The cause is considered to be exposure to cold winds below 5° C. The crowns died back but new shoots appeared below the point of girdling. The recommended treatment was to head back, and later to remove all but 1–2 of the most vigorous new shoots.

4338. Jameson, J. D., Thomas, D. G., and Downie, D. L.
**Virus-like symptoms in coffee.**
*Rec. Invest. Uganda Dep. Agric. 1950/52*, **3**, 1954, pp. 20-2, bibl. 4.

The symptoms of a virus-like disorder that has been recognized in robusta coffee in Uganda for some 20 years are puckering, vein clearing, coarse mottling or water-soaked patching, and tipburn of the leaves, short internodes and profuse secondary branching. In experiments the disorder was commoner in unshaded than in shaded trees (18·1 and 7·7%) and in some varieties than others, its incidence in 8 varieties ranging from 2·3 to 28·3%.

4339. Mathew, K. T.
**Studies on the black rot of coffee. I. The disease in South India and some general considerations.**
*Proc. Indian Acad. Sci., Sect. B*, 1954, **39**: 133-70, bibl. 47, illus.

In South India black rot of coffee (*Pellicularia koleroga*) is severe in those areas which have heavy monsoon rains from June to September. The disease, which attacks young shoots, leaves and berries, may reduce yields by 10% to 20%. The fungus is spread by contact from plant to plant and has a wide host range, showing in Mysore a preference for rubiaceous plants. Studies were also made on the life cycle, culture and pathogenicity of the fungus.—Univ. Bot. Labs, Madras.

4340. Barat, M. H.
Observations sur les maladies du caféier et des arbres d'ombrage sur la côte est. **(Notes on the diseases of the coffee tree and its shade trees on the east coast [of Madagascar].)**
*Bull. Madagascar*, 1954, No. 95, pp. 323-47, bibl. 11, illus.

Experiments were made on the poisoning of old coffee trees and shade trees with a view to preventing root rot in replantings. Techniques were trunk injection, wound painting and soil application. Materials were sodium arsenite and growth substances. Notes are given on 3 root rots and their control, namely agaric rot (*Clitocybe tabescens*), phthiriosis (possibly *Bornetina*) of which *Lacnodius greeni* is the vector, and a third possibly due to *Fomes lamaensis*. The first, whose hosts include the shade trees *Albizzia* spp., is by far the most widespread and severe and its control is discussed in some detail. Recommendations are made for the control of a rot (possibly due to *Poria*) of pruning wounds.

4341. Barat, M. H.
Études sur les maladies du caféier et des arbres d'ombrage dans les plantations de la côte est de Madagascar. Première partie. **(Studies on the diseases of coffee and shade trees in plantations on the east coast of Madagascar. First part.)**
*C.R. Rech. agron. Madagascar 1953*, No. 2, pp. 135-44, bibl. 12, illus.

The most serious of the root diseases attacking coffee and *Albizzia* is *Clitocybe tabescens*. A description is given of the fungus and its symptoms. At present, control is obtained by digging up and burning infected trees.

4342. Machado S., A., and Castaño A., J. J.
Modalidades de cultivo del cafeto y su relación con la incidencia del mal rosado (*Corticium salmonicolor* B. y Br.). **(The relationship of certain cultural practices to the incidence of pink disease (*Corticium salmonicolor*) in the coffee tree.)**
*Bol. inf. Colombia*, 1954, **5** (51): 33-4.

The results of recent investigations at Chinchina are: (1) bourbon is much more susceptible than tipico to pink disease; (2) the infection rate in multiple-, double- and single-stem trees was nil, 5 and 10% respectively in tipico and nil, 32 and 46% in bourbon; (3) the infection rate among plants established in holes of 30×30×30 cm. was 2% in tipico and 28% in bourbon, and that of plants in holes 40×40×40 cm. 5% in tipico and 32% in bourbon.

4343. Meiffren, M.
Comment sont orientées les recherches sur la trachéomycose du caféier au laboratoire de phytopathologie. **(Research on coffee tracheomycosis at the Plant Pathology Laboratory.)**
*Bull. Centre Rech. agron. Bingerville*, 1953, **8**: 91-6.

This paper includes notes on direct control by (1) prompt eradication of infected trees and treatment *in situ* of the tree and its roots and the soil with 10% carbolineum emulsion, and (2) protective spraying and painting of the trees in several adjacent rows. Robusta INEAC is very resistant.

4344. Godoy, C., Jr.
Infestação de broco na "saia" e na "ponta" do cafeeiro. **(Incidence of the coffee berry borer in the lower and upper parts of the crown.)**
*Rev. Agric. Piracicaba*, 1954, **29**: 103-6, bibl. 13.

*Stephanoderes hampei* overwinters in unharvested coffee berries remaining on the tree or on the soil and the females attack the new crop in October/December. Investigations showed that the densely shaded lower part of the crown is the chief focus of the pest. Particular attention should therefore be paid to this part of the tree in sampling green fruits to determine the date for beginning control by dusting with BHC.—Esc. sup. Agric. "Luiz de Queiroz".

4345. González-Mendoza, R.
Combate químico de cóccidos radiculares del cafeto. (**Chemical control of coffee root mealybugs.**)
*Bol. inf. Colombia*, 1954, **5** (54): 17-23, bibl. 7, illus.

Experiments [not described] are in progress at the National Coffee Research Centre on the control with organic insecticides of the mealybugs *Eumyrmococcus* sp. and *Rhizoecus coffeae* with which are associated the ants *Rhizomyrma fuhrmanii* and *R. robae*. On the basis of these experiments and of a study of the relevant literature the following recommendations are made for the control of root mealybugs: (1) treat the sowing or planting site with 1% dieldrin, chlordane or aldrin in water, (2) apply 2–5 l. of one of these insecticides in a circular area under the crown annually at the beginning of the rains. To control collar mealybugs: (1) treat widespread attacks as for root mealybugs, (2) in the case of local attacks lay bare the collar, apply 3 l. 1% creoline in water with 0·5% dieldrin, DDT, chlordane or aldrin added, or one of these insecticides alone at 1%, and replace the earth.

## *Guavas.*

(*See also* 4446e, 4447g.)

4346. Kuperberg, J.
**Rooting guava (*Psidium guajava* L., c. Supreme) stem cuttings in a hydroponic mist-type plant propagator.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 220-3, bibl. 8, illus.

Experiments were made at Miami with guava cuttings in 2 hydroponic units, one of which was operated with a nutrient mist and the other with only water as a mist. No rooted cuttings were obtained from the nutrient mist propagator. 18% of the cuttings in the water mist unit had produced roots after 12 weeks. There was a correlation between water volume and the number of rooted cuttings, which suggested that small differences in the average hourly mist volume made the difference between high and low root production. Leaf drop by cuttings in the propagation unit appeared to be largely influenced by low temperature.

4347. Singh, K. K., and Mathur, P. B.
**Cold storage of guavas.**
*Indian J. Hort.*, 1954, **11**: 1-5, bibl. 5.

Large and small fruits of the Safeda variety of guava picked when first starting to turn yellow were stored at 5 temperatures ranging from 35° to 87° F. The longest storage life, approximately 4 weeks, resulted from a temperature of 47°–50° F. with an R.H. of 85–90%; post-storage life at 76°–87° F. was about 3 days. Weight losses were lower in the large fruits than in the small. The latter contained more vitamin C, but losses in vitamin C were considerable in both size groups at all storage temperatures. During storage total acids content declined while total soluble solids tended to increase.

## *Mangoes.*

(*See also* 3639, 4447h, p.)

4348. Pirzada, A. G.
**Progress of mango cultivation in Sind with special reference to Bharati varieties.**
*Agric. Pakistan*, 1952, **3**: 98-9.

The soil and climatic requirements, propagation, pests and diseases of the mango are briefly discussed. Among 40 varieties originating from Sind and elsewhere that have been under trial by the Sind Department of Agriculture for 20 years at Mirpurkhas the local variety Sindhri is the most successful. Twelve other satisfactory varieties are named.—Government Fruit Farm, Mirpurkhas.

4349. van der Meulen, A.
**Why and how mangoes are budded.**
*Fmg S. Afr.*, 1954, **29**: 209-12, bibl. 3, illus.

Propagation by budding is successful. Sabre has proved to be a good rootstock; Kidney as a rootstock produces too high a percentage of off-type seedlings, and Peach is very difficult to transplant from the nursery. The raising of the rootstocks, budding, and after care are all fully described.

## *Oil palms.*

4350. Johnson, R. M., and Raymond, W. D.
**The African oil palm, *Elaeis guineensis*.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 14-23, bibl. 14, illus.

Recent work on the oil palm is reviewed against the background of earlier established fact. Aspects considered include climatic and soil conditions, varieties, seed germination, nurseries, planting, cover crops, manuring, yields, harvesting and oil extraction.

4351. Broeshart, H.
**The use of foliar analysis in oil palm cultivation.**
*Trop. Agriculture Trin.*, 1954, **31**: 251-60, bibl. 4.

As a result of analyses of large numbers of samples of oil palm leaves taken from field experiments and plantation areas, the author draws conclusions as to optimum contents of K, P, Ca and Mg. Both the actual percentages and the ratios between the elements give valuable indications as regards the type and degree of deficiency, and from these data appropriate fertilizer applications may be determined.

4352. Ferwerda, J. D.
**Boron deficiency in oil palms in the Kasai region of the Belgian Congo.**
*Nature*, 1954, **173**: 1097, bibl. 2.

In a manurial trial involving major and minor elements it was shown that the little-leaf disease of oil palms is directly related to boron deficiency. It was also found that symptoms similar to little-leaf may be produced by insect damage.

## *Papaws.*

(*See also* 4446p,)

4353. Hamilton, R. A.
**A quantitative study of growth and fruiting in inbred and crossbred progenies from two Solo papaya strains.**
*Tech. Bull. Hawaii agric. Exp. Stat.* **20**, 1954, pp. 38, bibl. 24, illus.

A study was made of progeny produced by making all possible self- and cross-pollinations with 2 hermaphrodite and 1 female from each of 2 Solo variety strains, namely, a 7 generation inbred strain and an open-pollinated commercial strain. Measurements of growth and development showed a uniformity of breeding behaviour, and it is concluded that inbreeding of Solo strains by selfing may not result in a serious reduction in plant vigour.

4354. Bykov, B. A.
*Carica quercifolia* **grown indoors.** [Russian.]
*Priroda*, 1954, **43** (4): 113-14, illus.

A note on young papaw seedlings grown in a Moscow house in windows facing south-east. The plants, raised from pre-germinated seed sown in February 1952, were transplanted twice, and in 1953 some artificially pollinated flowers produced fruit.

### *Pineapples.*

(*See also* 4446m.)

4355. Malan, E. F.
**Pineapple production in South Africa. (With special reference to the Eastern Transvaal.)**
*Fmg S. Afr.*, 1954, **29**: 175-80, 201-5, 212, 255-60, bibl. 43, illus.

The importance of the pineapple industry in South Africa has increased enormously since the last war, and the estimated yield for 1953–54 is 75,000 tons valued at £1,300,000. This article deals fully with all aspects of pineapple production in South Africa.

4356. Williams, B. L., and Wender, S. H.
**Preliminary investigations of the possible flavonol content of the pineapple.**
*Proc. Okla Acad. Sci. 1952*, 1954, **33**: 249-50, bibl. 3.

In studies on pineapple no flavonoid compounds similar to those occurring in strawberries, grapes and black currants could be found in the inner portion of the fruit.

### *Rubber trees.*

(*See also* 4446d, l, n, 4447b, k, o, q, r, 4490.)

4357. Spoon, W.
**Rubber in Liberia.** [Dutch, with English and Indonesian summaries 29 and 36 lines respectively.]
*Bergcultures*, 1954, **23**: 327-31, bibl. 5.

Rubber growing in Liberia is carried on both by local farmers on 17,000 acres and by an American rubber company on 83,000 acres. Almost all the rubber is exported to the United States.

4358. I.N.E.A.C. (Evers, E.).
Progrès realisés dans la sélection et la culture de l'hévéa en 1953.* **(Progress made in the selection and culture of hevea in 1953.)**
*Bull. Inf. INEAC*, 1954, **3**: 69-80.

Work described in this progress report includes: *Selection.* Preselection in the nursery and plantation; relationship between early tests of yield by various means and actual productivity in the first years of tapping; selection of planting material. *Culture.* A spacing, density and thinning trial with Tj. 16 was laid down in 1940. Of 4 original densities ranging from 330 to 750 per ha. that of 500 subsequently thinned to 300 gave the highest annual yield in 1953, namely 1,212 kg. per ha.; in 2 sets of plots at this original density the average annual yield for the first 9 years was about 200 kg./ha. greater at a spacing of 6·66 × 3 m. than at one of 10 × 2 m. Other investigations showed that rain had no effect on the tapping yield of the day on which it fell nor of the next day but that the day's yield was greater after a shady than after a sunny forenoon.

4359. Beaufils, E. R.
Diagnostic minéral sur des "*Hévéas brasiliensis*". **(Mineral diagnosis in *Hevea brasiliensis.*)**
*Op. tech. Inst. Rech. Caoutch. Indoch.* **19/54,** 1954, pp. 46, bibl. 28.

A detailed account is given of recent studies at Laikhê on mineral nutrition in rubber based on leaf analysis. The sampling and analytical methods are described. Leaf mineral composition was investigated with reference to growth cycle, mineral element relationships, mineral fertilization, latex characters, physiological disorders of the panel, yields, and variation in leaf $K_2O/CaO$ ratio in relation to variations in yield, d.r.c., and panel disorders. A summary of the major results and conclusions follows. A definite interdependence between mineral elements in the leaf exists; a K/Ca inverse relationship, and direct relationships of Cu, P, N and Fe with K, and of Mn and Mg with Ca were noted. Leaf mineral composition reacted to soil fertility and to manuring with K and P but not with N, owing, no doubt, to the leaf N content being above the critical level. Correlations of 2 types were found to exist between leaf mineral composition and yield; some showed at any given moment a better yield correlated with improved assimilation reacting on leaf mineral composition, and others showed how yield varies during the year with the requirements of the foliage. The relationships found to exist between leaf mineral composition and that of latex—for example, the correlation between latex Mg and leaf $K_2O/CaO$—were important in relation to panel disorders. Such disorders appear to constitute cases of extreme instability of latex; Mg and an abnormally high P/Mg ratio in the latex are apparently important factors. The investigations suggest that the different minerals may have the following roles: K and P deficiencies, not necessarily reflected in growth, may limit yield; Ca deficiency may also limit yield; Cu is partly linked with K and may play a part in assimilation and translocation; a too high Cu/Mn ratio is unfavourable. [See also *H.A.*, 23: 4638.]

4360. Bolle-Jones, E. W.
**Nutrition of *Hevea brasiliensis*. I. Experimental methods.**
*J. Rubb. Res. Inst. Malaya*, 1954, **14**: 183-207, bibl. 35, illus.

A sand culture technique suitable for the production of *Hevea* plants of known nutritional status, and analytical methods for the estimation of the macro and micro nutrients and chlorophyll in the laminae have been investigated and satisfactory procedures established. New, rapid and simple methods are described for the estimation of petiolar rubber content and the chromatographic determination of each sugar present in the laminae. [Author's summary.]

---

* From the 1953 annual report of the Hevea division of I.N.E.A.C.

4361. LANGFORD, M. H.
**Hevea diseases of the Amazon valley.** [Portuguese, French and German summaries 1¾, 2 and 2 pp.]
*Bol. téc. Inst. agron. Norte* **27,** 1953, pp. 28, illus.

Notes are given on the major hevea diseases of the Amazon valley, their distribution in the region, damage caused, symptoms, causative fungi, and control. A summary of the control measures follows. (1) South American leaf blight (*Dothidella ulei*): spraying high-yielding blight-susceptible clones with 1·5% zinc ethylene bisdithiocarbamate to bring them to top-budding size, followed by use of blight-resistant crowns. (2) Fruit rot, leaf fall, dieback and panel decay (*Phytophthora palmivora*): use of phytophthora-tolerant top-budding clones, opening of new tapping panels in the dry season only. (3) Target leafspot (*Pellicularia filamentosa*): spraying with zinc ethylene bisdithiocarbamate in the nursery, use of tolerant top-budding clones in areas where damage is severe. (4) Glomerella dieback (*Glomerella cingulata*): application of complete fertilizer. (5) Black crust (*Catacauma huberi*): avoidance of highly susceptible clones. (6) Pink disease (*Corticium salmonicolor*) and root diseases: no control required as these diseases are not serious in the area. (7) Collar rot, of which sunscald is the chief cause: mulching, planting some months in advance of periods of hot dry weather.

## *Sugar cane.*

(*See also* 3676, 4446b, c, g-k, o, t, v, y, 4447a, e, f, j, m, n, u, w-z, 4461, 4476, 4486, 4488, 4489.)

4362. MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE.
*First Annual Report of the Executive Board of the Mauritius Sugar Industry Research Institute, 1953,* 1954, pp. 7.

The Mauritius Sugar Industry Research Institute came into legal existence on 29 June, 1953, through the transfer of the Sugarcane Research Station from Government to the Sugar Industry. The chief subjects of this report are the structure, personnel and finances of the new Institute and the conditions of its transfer.

4363. BARNES, A. C.
**Contrasts and comparisons.**
*S. Afr. Sugar Yearb.*, reprinted in *World Crops*, 1954, **6**: 321-4.

The author compares conditions and cultural practices in the Natal sugar industry with those obtaining in other parts of the world.

4364. GARCIA MENDEZ, J. B.
**Economic problems of Puerto Rican sugarcane growers.**
*Sugar J.*, 1954, **16** (6): 50-2.

Increased costs of labour and materials and higher taxation raised the cost of growing, harvesting and delivering one ton of cane by nearly 20% between 1948/49 ($ 8.17) and 1952/53 ($ 10.16). The gross income per ton in the latter year was only $ 9.76 per ton. Since then the price of sugar has fallen by about a dollar a ton.

4365. ARCENEAUX, G.
**Some neglected aspects of experimental procedure in making comparative tests of sugarcane varieties.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 429-40, bibl. 13.

Present-day concepts of experimental error and statistical significance reflect undue emphasis on experimental precision in relation to factors operating within individual experiments. The importance of sampling the effects of over-riding variables such as variations in weather conditions and in level of insect injury for a more reliable estimate of statistical significance is emphasized. An analysis of trends in variety × year interaction over a period of time is illustrated and proposed as a means of measuring a decrease in varietal yield capacity commonly called "varietal deterioration". Use of field samples of cane from plots of a well-designed experiment permits varietal comparisons in juice analysis of a high order of statistical accuracy. Ordinarily twenty to thirty stalks from each plot will give an adequate sample. Sampling of juice from individual samples of sugar cane by means of a fractionating device illustrated in this report gave a significant reduction in experimental error as compared with results obtained by dipping out the sample after stirring. The application of pilot-plant technique in the measurement of varietal differences in milling qualities is discussed in the light of results obtained over a period of twenty years. [From author's summary.]

4366. STEVENSON, G. C.
**Sugar cane varieties in Barbados. An historical review.**
[*Publ.*] *B.W.I. centr. Sugar Cane Breed. Stat., Barbados*, 1954, pp. 26, bibl. 38.

An account is given of the early history of sugar cane and its varieties and of breeding in Barbados. In 1953 B.37161 was still by far the most widely planted cane in Barbados. Other varieties of current importance are B.4098 for intermediate and high rainfall areas and B.41211 for dry areas.

4367. BARBADOS.
*A.R. B.W.I. centr. Sugar Cane Breed. Stat., Barbados, for year ending Sept. 30th, 1952,* pp. 41.

*Plant cane trials.* None of the B.48 series was as good as the standard varieties. *First ratoon trials.* B.4738 and B.4747 yielded well in the low and intermediate rainfall areas, but B.4744 maintained its lead. In the higher rainfall areas B.4744 and B.47419 maintained their early promise. *Second ratoon trials.* B.45151 and B.46364 performed well in the high rainfall areas. *Select seedling trials.* Except on one soil group B.41211 (and B.46223 and B.46397 which are now considered to be the same as B.41211) have outyielded B.37161 and B.4098. *Performance of varieties in contributing colonies* is reported.

4368. BIRKETT, L. S., AND CAMERON, C.
**Field experiments with sugar cane. XXII.**
*Sugar Bull. Brit. Guiana Dep. Agric.* **22,** 1954, pp. 1-39.

Fifty-nine variety trials made in 1953 are described, a performance summary is given and recommendations are made concerning varietal representation on different soils. B.37161 continues to be used as the standard cane, but B.41227, a good commercial cane which yields well both as plants and ratoons, arrows lightly and late and has good juice quality, is generally more reliable for this purpose; both these varieties are recommended for extensive planting. Varieties recommended for limited commercial planting are the leaf-scald-resistant B.4098 and B.4373, the leaf-scald-tolerant B.4362, B.46378 and B.43413, and the high-yielding D.37/45.

4369. Ray, T., and Stewart, C. W.
**Evaluation of sugar cane varieties for 1953.**
From abstr. in *Sugar J.*, 1954, **16** (10): 26-7.

This U.S. Department of Agriculture project is divided into 3 phases: (1) the development of small-scale milling tests on samples of less than 100 lb. from which the yield, quality and clarification characters of the juice and the quantity and composition of the bagasse is determined; (2) the development of a method of taking representative samples from 2-ton lots; and (3) the testing of these procedures by correlating their results with those of a factory pilot plant. The characters used are listed.

4370. Brett, P. G. C.
**The first ten years of sugar cane breeding in Natal.**
*S. Afr. Sugar J.*, 1954, **38**: 309-15, bibl. 6.

Policy, methods and a proposed change in the technique of seedling selection are discussed. Of the 3 main varieties in Natal Co. 301 can be expected to decline and Co. 331 and N: Co. 310 to increase in importance. Notes are given on two recently released varieties, N:Co. 293 and N: Co. 339, and on varieties under trial.

4371. Locsin, C. L.
**Sugar cane variety tests in the Victorias milling district during 1952-53.**
*Sugar News*, 1954, **30**: 112-14.

The 4 most commonly grown canes were planted in every month of the year and harvested after 12 months. CP.29/116 and H37-1933 gave higher average sugar yields than P.O.J. 2883 and P.O.J. 3016, mainly due to their better performance in the period June–January, which corresponds approximately with the wet months.

4372. Buzacott, J. H.
**Curiosities among the New Guinea canes.**
*Cane Grs' quart. Bull.*, 1954, **18**: 3-8, illus.

Notes are given on the following curiosities in cane varieties introduced into Queensland by the 1951 New Guinea Expedition: abnormal stalk shape, abnormal stalk colour, leaf hairiness and abnormal size of arrow.

4373. Coleman, R. E.
**The effect of dry storage before planting on the germination of sugarcane cuttings.**
*Sugar J.*, 1954, **16** (10): 35-6, 38, bibl. 5.

An account is given of 2 years' experiments in Louisiana in which setts of CP varieties stored for 6 days at 95° F. and 50% R.H. before planting showed more rapid germination and a higher final germination rate than freshly cut material. The better performance of stored setts may be due partly to an increase in the ratio of reducing sugars which provide a readily available carbohydrate supply sufficient to sustain more rapid growth and partly to changes in the auxin relationship.—U.S. Dep. Agric.

4374. Innes, R. F.
**The inorganic fertilizer practices of the principal British Caribbean sugar producing territories.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 156-68, bibl. 37.

*Nitrogen.* The chief factors governing N requirement appear to be availability of water and whether the crop consists of plants or ratoons. In general, the average applications to plant and ratoon crops respectively are 2–4 and 3–4 cwt. per acre of sulphate of ammonia. Experimental evidence in favour of split application is lacking but the practice is well established in some places. N depresses juice quality throughout the area. *Phosphate* response varies greatly with soil type. In general, the optimum economic application ranges from 1 to 4 cwt. per acre of 18% superphosphate. *Potash* dressings are of considerable importance in most B.W.I. areas. Requirements are closely related to soil type but applications are also determined by water availability. Muriate and sulphate appear to be equally effective, applications ranging from ½ to 3 cwt. per acre. Delaying or splitting the application is not advantageous. K usually has a beneficial effect on juice quality.

4375. Rouillard, G.
**Relation between vegetative index and weight of sugar per acre.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 317-19.

Experiments in Mauritius with the standard variety M.134/132 have shown that the vegetative index, based on the weight of samples of leaves, is an accurate guide to the response of cane to inorganic fertilizers, especially P and K, and a useful, though less accurate, guide for organic fertilizers. The method involves collecting 20 leaves of the third rank at random from each plot in January/April, when plant canes are 8–10, and ratoon canes 5–7, months old. The following formulae then apply: (1) For inorganic fertilizers: wt of sugar $=(\text{wt of leaves}\times 1\cdot 3)-29$ (the correlation coefficient being 0·70). (2) For organic fertilizers: wt of sugar $=(\text{wt of leaves}\times 0\cdot 64)+41$ (the correlation coefficient being only 0·40).

4376. Schroo, H.
**The use of pot tests in research on the fertility of sugar cane soils. Paper V: A pot test on the relative effectiveness of forms and placements of phosphatic fertilizers.**
*Trop. Agriculture Trin.*, 1954, **31**: 242-50, bibl. 2.

Using a highly acid soil low in phosphate, sugar cane was grown in 4 gal. tins for 14 weeks. In a preliminary test the efficiency of 3 different placements of mono-calcium phosphate were compared; in a final test the relative efficiencies of mono- di- and tri-calcium phosphates were tested in the presence and absence of lime, when spread through the top 6 inches of soil. Final yield data based on tiller count, total shoot length and fresh weights of aerial parts, were taken as indicators of treatment responses. Results in the preliminary test showed that with concentrated fertilizer placement beneath the sett no further yield responses were obtained with phosphate applications above 5 g. $P_2O_5$, but when the fertilizer was dispersed through the rooting medium yields increased with doses up to 11¼ g. $P_2O_5$. In the final test, dressings equivalent to ½ and 2 cwt. of mono-calcium phosphate per acre gave better yields, under limed and unlimed conditions, than di- and tri-calcium phosphate. Lime treatment caused considerable yield depression, probably as the result of excessive N loss through volatilization. Such losses may be expected to happen under field conditions, if ammonium sulphate dressings are applied and left on top of calcareous soils during hot, dry weather. [See also *H.A.*, 24: 2052, 2079f, and 3220.]—Imp. Coll. Trop. Agric., Trinidad.

4377. Birkett, L. S.
**A review of fertilizer and manurial experiments on sugar-cane in British Guiana, 1930-53.**
*Sugar Bull. Brit. Guiana Dep. Agric.* **22**, 1954, pp. 41-54, bibl. 19.

Soil types and plant nutrient requirements and the methods of determining them are discussed. Investigations have shown that positive yield responses are practically universal with nitrogen and very common with potash, phosphate and lime. Preliminary work suggests that plant analysis is the best means of determining fertilizer needs.

4378. Parthasarathy, S. V., and Lakshmikantham, M.
**Nitrogenous manuring to sugarcane in Madras (India).**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 144-56, bibl. 28.

Nitrogenous manuring of sugarcane in Madras in relation to organic and inorganic forms of N and their influence on the quality of gur is dealt with in this paper. The economic optimum dose of N in the different localities ranged from 100 to 250 lb. per acre. Quality of juices and of gur manufactured from them was adversely affected by higher nitrogenous manuring. Among the varieties tested Co. 419 was found to be the most efficient utilizer of applied N with reference to cane production. Giving fertilizer in two doses, the second application synchronizing with the onset of monsoon rains, and the completion of fertilization within about four months after planting were found to yield maximum C.C.S. Application of fertilizer in pockets 6 in. deep in soil near cane clumps was found to give higher yields than when it was applied superficially and covered. Ammonium sulphate gave slightly higher cane yields than other fertilizers, but recoverable sugar was highest when it was applied as a mixture with organic concentrates like oil cakes. With the same dose of N, a mixture of oil cake and ammonium sulphate gave better quality gur than ammonium sulphate alone. Under low soil moisture conditions the response to groundnut cake and organic concentrate was much higher than to sulphate of ammonia. [From authors' summary.]—Sugarcane Res. Stat., Anakpalle.

4379. Lal, K. N., De, R., and Subba Rao, M. S.
**Studies in crop physiology. Effect of nitrogen, phosphorus and potassium deficiencies on respiration rate of sugarcane leaves.**
*Proc. Indian Acad. Sci., Sect. B*, 1951, **33**: 1-13, bibl. 31 [received 1954].

Studies were made on the respiration of leaves of 5 sugar cane varieties, Co. 453, Co. 421, P.O.J. 2878, Co. 205 and Rheora, grown in sand cultures. Four levels of nutrition were supplied, complete nutrition, minus N, minus P and minus K. Results showed that considerable changes in respiration of leaves were brought about by nutritional conditions. N-deficient leaves showed normal respiration at maturity as compared with P- or K-deficient leaves, each of which have a high respiration rate. Variations in respiration appear to be due to chemical changes in the leaf, particularly of N and carbohydrate fractions.

4380. Muschett, W. R.
**Comparative results of artificial fertilizers and organic manures.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 169-75, bibl. 8.

Experiments in the drier unirrigated sugar cane areas of Jamaica showed that artificial fertilizers give, at much less cost, most of the benefits obtained from the system of cattle penning with mulching known as fly-penning. The effects of the latter are chiefly confined to the succeeding crop, while those of artificials last through 3 crops. K is the dominant factor.

4381. Sturgis, M. B., and Byrnside, D. S., Jr.
**Summary of ten years' work with complete fertilizers on sugarcane.**
*Sugar J.*, 1954, **17** (1): 27-9.

The results are summarized of a large number of fertilizer trials carried out between 1942 and 1951 on two main soil types in Louisiana. The main fertilizer recommendations based on them are: (1) *plant cane:* 40–60 lb. N per acre where the land was not heavily green manured beforehand, and no fertilizer where the leguminous green manure crop reached 9–10 tons per acre; (2) *ratoons:* 80–100 lb. N on medium to heavy alluvial soils, plus 25–40 lb. $P_2O_5$ and 40–60 lb. $K_2O$ where deficiencies of these elements exist, and NPK at the above rates on all light to medium-textured soils. Notes are given on timing, split applications, and placement.—La agric. Exp. Stat.

4382. Davidson, L. G.
**Comparative effects of selected fertilizer treatments on yields of different varieties of sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 189-95, bibl. 2.

A study of yield data obtained in 24 variety-fertilizer tests carried out in Louisiana between 1939 and 1950 has shown significant differences in the yielding capacity of the varieties used, in yields resulting from various fertilizer treatments, and in relative yields resulting from variety × fertilizer interactions. Results of these tests indicate that the use of equal quantities of fertilizer has resulted in significantly different yield responses with some of the varieties used in these experiments.—U.S. Sugar Plant Field Station, Houma, La.

4383. Chardon, F.
**Fertilizer practices in Puerto Rico.**
*Sugar J.*, 1954, **16** (6): 40, 42-3.

The fertilizer experiments of the Agricultural Experiment Station of the University of Puerto Rico show that sugar cane requires considerable N and moderate K but gives a negligible response to P. The 2 most widely used formulae are 12-6-10 and 12-4-10 and these are sometimes followed by top dressings of sulphate of ammonia. Practice varies but the average application in the island is about 160 lb. N, 45 lb. $P_2O_5$ and 105 lb. $K_2O$. Applications are normally heavier for plant cane harvested after 18 months than for ratoons which are usually harvested after 12 months or for spring plantings. In the dry, irrigated south sulphate of ammonia alone is sometimes used. No important minor element deficiencies are known.

4384. Landrau, P., Jr., and Samuels, G.
**Response of four sugarcane varieties to fertilizers during the first Isabela cycle, 1946-51.** [Spanish summary ⅔ p.]
*J. Agric. Univ. Puerto Rico*, 1954, **38**: 73-95, bibl. 3.

A variety-fertilizer experiment using 4 varieties and 7 different fertilizer levels was carried out on a plant cane and three ratoon crops at the Isabela Sub-station on a Coto clay. The main results were: (1) N gave the greatest sugar/acre yield increases; (2) P gave significant cane yield increases in the ratoon crops; (3) K gave no sugar/acre yield increase; (4) neither N, P nor K influenced sucrose concentration significantly; (5) PR 905 gave significantly greater sugar/acre yields than P.O.J. 2878 and M.28; (6) omission of N, P or K caused sugar/acre yield reductions of 22, 14 and 4% respectively; (7) in the third ratoon crop leaf N below 1·39% dry matter and P below 0·16% represented deficiency.

4385. Bernardy, P.
**Some thoughts on green manuring in the Natal sugar belt.**
*S. Afr. Sugar J.*, 1954, **38**: 163-5.

Practical experience leads the author to the conclusion that green manuring is generally of less importance than water conservation and should only be practised under conditions of adequate rainfall, a minimum of 40 in., or under irrigation.

4386. Yusuf, N. D., and Sheikh, M. A.
**Ratooning in sugar cane.**
*Agric. Pakistan*, 1951, **2**: 132-6 [received 1954].

The results of experiments with Co. 312 and other varieties at Lyallpur Sugarcane Research Station in 1949/51 showed that: (1) harvesting the plant crop in mid-February gave a better ratoon crop than harvesting in mid-December and mid-January, apparently because late harvesting afforded better frost protection; (2) farmyard manure had the maximum effect on the ratoon crop when applied in March after the frost period; (3) high N (210 lb.) gave twice the yield of no N; (4) liberal irrigation gave higher yields than restricted irrigation; (5) thorough inter-row cultivation gave higher yields than weeding only; and (6) only the first ratoon crop was profitable.

4387. Gómez Alvarez, F.
**Influence of ground water on the composition of sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 195-9.

In parts of Venezuela cane juice has an excessive salt content due probably to potassium sulphate in the underground water used for irrigation. Suggested remedies include deep ploughing, improved drainage and the use of irrigation water from other sources.

4388. Sun, V. G., and Liu, P. D.
**The effect of "earthing" of sugarcane by hand labour upon its growth and sugar yield in Taiwan.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 276-83, bibl. 5, illus.

Earthing up was compared with no earthing up in a plant cane crop of F.134. Earthing up was performed in 3 stages in February, April and June, the final mounds being 30 cm. high. In the control plots the planting furrows were merely filled in until the soil was level. Earthing up produced significant increases in the yields of millable cane and sugar and in average length of cane stalks. There were, in general, no significant differences in sugar percentage, number of millable and dead stalks or stalk diameter.—Taiwan Sugar Exp. Stat., Taiwan.

4389. Herbert, L. P., and Matherne, R. J.
**Results of tests conducted over a number of years to determine the effect of shaving sugarcane on yields.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 253-9, bibl. 3.

Shaving consists of cutting back sugar cane in late winter or early spring with a horizontally revolving disc cutter. Tests in Louisiana in 1947/50 led to the following conclusions: (1) yields of plant cane were constantly depressed by shaving, especially the late shaving of August-planted cane; (2) shaving summer-planted cane probably reduced subsequent first ratoon yields; (3) shaving did not measurably reduce indicated yields of sugar per ton of cane except after the unusually mild winter of 1949/50; (4) shaving is much more injurious in some years than in others and is especially so following unusually mild winters.—Bur. Plant Ind., Soils, agric. Engng, U.S. Dep. Agric.

4390. Shaw, H. R.
**An international glance at sucrose content of cane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 283-91, bibl. 21.

The hypotheses are advanced that cane quality is an inherent function of latitude and that day-length is the causal agency. A curve based on international data is bi-modal in form with peaks of superior sucrose content of about 15% at approximately 18° N and S. Beyond these latitudes sucrose content falls rapidly to about 10% as the apparent ecological limits of 30° N and S are approached. The decline towards the nadir of the curve at the equator—about 10%—is appreciable but less rapid.—Cia. azuc. La Estrella, S.A., Panama.

4391. Vijayasaradhy, N., and Narasimhan, R.
**Control of flowering in sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 371-401, bibl. 15, illus.

The results are reported of detailed studies at Coimbatore on the effects of photoperiod, irrigation and nutrition on certain wild and cultivated forms of sugar cane. Deviations from the normal of as little as 1 or 2 hours in day-length in either direction will suppress flowering. Varieties showed marked differences in response to various photoperiod treatments. Applying short- or long-day treatments during the vegetative phase, i.e. before flower primordia initiation, inhibited flowering. Applying these treatments when flower primordia have just been formed resulted in delayed flowering. Applying these treatments in the post-initiation phase had little effect. Frequent irrigation generally accelerated flowering, but the effect of manures, at the levels tested, was not marked, though in one case an interaction was found between photoperiod and manure. Flowering was induced in two non-flowering wild forms of *S. spontaneum* by widely different treatments, but inconsistencies between the responses to treatments in different years indicate the need for further investigation. Data are presented on the development of the inflorescence in sugar cane and on the morphological relationships between the inflorescence and subjacent organs.

4392. Paliatseas, E., and others.
**The production of true seed of sugarcane in Louisiana.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 361-4, bibl. 5, illus.

In Louisiana early frosts normally inhibit flowering and the breeding programme is based on seed from crosses made in Florida. Since 1948, however, viable seed has been obtained in greenhouse experiments at Grand Isle, La, by maintaining night temperatures at 75° F. and over.

4393. Paliatseas, E., and Chilton, S. J. P.
**Some observations on the effect of temperature on the production of pollen by certain varieties of sugarcane in Louisiana.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 364-6, bibl. 7.

Tests using South African techniques have shown that some varieties that are pollen-sterile in the field give viable pollen in heated greenhouses.—La agric. Exp. Stat., and La St. Univ.

4394. Loh, C. S., Tseng, P. M., and Tang, C. K.
**Rind hardness of sugar cane stalks.**
*J. Sugar Cane Res., Taiwan*, December 1952, **6**, Nos. 11-12, from condensed version in *Sugar, N. York*, 1953, **48** (6): 45-7.

A study was made in Formosa of rind hardness in sugar cane stalks, which is an inheritable characteristic associated with the degree of lignification of the peripheral tissues. Results and conclusions were that: (1) lignification is impeded by leaf sheaths and can be prevented by wrapping rice straw mats around cane stools; (2) rind hardness decreases as the period of daily sunlight decreases; (3) varieties with inadequate rind hardness would be of no commercial value owing to high loss from typhoons and rats; (4) the interspecific crosses of *Saccharum officinarum* and *S. norenga* have sufficient hardness. The grades of hardness of Taiwan breeding canes are listed.

4395. Wang, C. C.
**Studies on the effect of snow and frost injuries to sugarcane.** [Chinese, with English summary 1½ pp.]
*Mem. Coll. Agric. nat. Taiwan Univ.*, 1953, **3** (2): 44-62, bibl. 13, illus.

Studies were made on the cold resistance of many varieties of sugar cane. The Co and CP varieties showed the lowest average percentage of injuries. Cold resistant varieties were almost equally resistant against frost and snow. Leaf thickness was positively correlated with frost resistance. Cold resistant varieties had more fibre cells and phloem fibres in the large vascular bundles than susceptible varieties. Varieties bred from *Saccharum barberi* and *S. spontaneum* showed the greatest, and those from *S. officinarum* the least, cold resistance.

4396. Kreibohm de la Vega, G. A.
**Application of hormones to sugar cane.**
*Industr. azuc.*, 1952, **58** (710): 298-304, **58** (711): 4-11, from abstr. in *Sugar, N. York*, 1953, **48** (10): 50, 52.

2,4-D was applied as a 0·005% spray at 60 gal. per acre and as a 2·5% dust at 10 lb. per acre to 10 varieties in tests to determine its effect on the sugar content of standing cane. The spray results were inconclusive but 80% of the dust treatments gave sugar increases. In the dusted plots of the frost-hardy Tuc. 3342 and Tuc. 4441, the varieties which gave the greatest responses, increases of 2·73 and 2·87% respectively were recorded 17 and 43 days respectively after treatment: the sugar content later fell away again. The 2·87% increase represents a factory yield increase of 25·6 lb. of sugar per ton of cane.—Tucuman Exp. Stat.

4397. Chinloy, T., and Innes, R. F.
**Sampling of sugarcane for maturity testing.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 320-7, bibl. 2.

The relative efficiency of sampling whole stools and fractions of whole stools is evaluated on the basis of an experiment made in Jamaica. The method of sampling is described. Although variation between stools may be smaller than variation within stools, it is more efficient to take a fraction of whole stools than to take whole stools. For a fixed cost the optimum allocation of sampling is single canes from a large number of stools. The relative amount of cane required to give the same degree of accuracy is calculated for both sampling methods. Whole stool sampling requires five or six times as many canes as single cane sampling to give comparable accuracy. There is little difference in the variance between and within areas, which suggests that the sample could be drawn from the borders of the field without undue loss of accuracy. A proposal is made whereby the practical difficulties involved in random sampling may be overcome. [From authors' summary and conclusions.]

4398. Spence, J. A.
**Sugar cane diseases in British Guiana.**
*Sugar Bull. Brit. Guiana Dep. Agric.* **22**, 1954, pp. 73-5, bibl. 1.

*Leaf scald* [*Xanthomonas albilineans*]. Varietal resistance tables are given for breeding canes and for potential commercial varieties. Among the latter, 40 Barbados canes, 3 Demerara canes and one other are classified as resistant. *Ratoon stunting disease* is suspected in B.4098 on West Coast estates. *Chlorotic streak disease* continues to be found throughout British Guiana but causes no reduction in yield.

4399. Hughes, C. G.
**Chlorotic streak disease at Mackay.**
*Cane Grs' quart. Bull.*, 1954, **18**: 25-7, illus.

Chlorotic streak appeared in the Mackay district for the first time in 1954. Brief general notes are given on symptoms, distribution in Queensland, severity and incidence in relation to rainfall and soil moisture, control and varietal resistance. All the approved varieties except Co. 290 are susceptible.

4400. Stehlé, H.
La maladie à virus des stries aux Antilles françaises, son importance et les moyens de lutte. (**Chlorotic streak of sugar cane in the French West Indies, its importance and control.**)
*Agron. trop.*, 1954, **9**: 201-5, bibl. 23, illus.

Chlorotic streak is the most serious of the diseases of sugar cane in the French West Indies and causes yield reductions of up to 50%. P.O.J. 2878 is the most susceptible variety; B.37161, B.37172 and B.34104 are also very susceptible. The new Barbados varieties are relatively resistant. The control measures that have been put into practice include the use of resistant varieties and of setts from disease-free areas, hot water treatment, improved drainage and the removal of ratoon material before replanting.

4401. Hutchinson, P. B., and Robertson, J. R.
**Leaf scald in British Guiana.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 877-84, bibl. 17.

Leaf scald is present on all estates in British Guiana. Among the major cane varieties B.4098 is resistant and P.O.J. 2878, Diamond 10, B.37161, Co. 421 and B.40105 are tolerant, but in 1951 the very susceptible B.34104 accounted for 67% of total plantings. In addition to the control measures in general use elsewhere the destruction of diseased stools by flood-fallowing for 6 months under 6–12 in. of water and by pouring diesel oil into the spindle is practised. Transmission and yield reduction due to infection are discussed.—I.C.T.A., and Dep. Agric., Brit. Guiana.

4402. Costa, A. S., and others.
Resistência ao mosaico dos "seedlings" de cana de açúcar obtidos em 1950. (**Mosaic resistance of sugar cane seedlings bred in 1950.**) [English summary ¼ p.]
*Bragantia*, 1952, **12**: 285-90, bibl. 3, illus.

In inoculation tests of sugar cane seedlings of CP, Co and other parentage in 1950 the CP group were in general the most resistant to mosaic. The carborundum method gave better results than needle inoculation.—Inst. agron. Campinas.

4403. Dignadice, P. B., and Orillo, F. T.
**Yellow leaf spot of sugar cane.**
*Philipp. Agric.*, 1953, **37**: 36-49, bibl. 10, illus.

Yellow spot (*Cercospora kopkei*) is present throughout the Philippine cane areas but is of minor importance. An account is given of the causal organism and its pathogenicity and of control measures, including preliminary fungicide tests. In an inoculation experiment the varieties F.108, F.109 and Alunan proved resistant.

4404. Hughes, C. G.
**Red rot disease of sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 924-36, bibl. 33, illus.

The following aspects of the red rot disease of sugar cane, due to *Physalospora tucumanensis*, are reviewed: Distribution, symptoms, losses, transmission, resistance, and control by use of resistant varieties.—Bur. Sugar Exp. Stats, Queensland.

4405. Wahid, M. A., Steib, R. J., and Chilton, S. J. P.
**The use of fungicides to reduce the occurrence of red rot infection in stalks of standing cane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 936-9, bibl. 5.

Parzate and tribasic copper sulphate were both effective in reducing *Physalospora tucumanensis* infection in Co. 290 in experiments in 1948/50.—La agric. Exp. Stat., and La St. Univ.

4406. Luke, H. H., and Connell, T. D.
**Studies on antibiotic soil organisms. II. Bacteria and fungi antagonistic to *Pythium arrhenomanes* in sugarcane soils of Louisiana.**
*Phytopathology*, 1954, **44**: 377-9, bibl. 3.

3·6% of the Louisiana sugar cane soil bacteria and 16% of the soil fungi tested exhibited antibiotic activity towards *Pythium arrhenomanes*, the sugar cane root rot agent, in artificial culture. Fungi had larger inhibitory zones than bacteria. Bacteria were favoured by an alkaline, and fungi by an acid, soil reaction. The highest fungal antibiotic activity was obtained from soils in which root rot was most severe, whereas the antibiotic activity exhibited by bacteria was considerably higher in soils where root rot was not severe.—La St. Univ., Baton Rouge.

4407. Steindl, D. R. L.
**Sclerospora disease of sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 952-5, bibl. 3, illus.

History, symptoms, pathogen and control of the rare sclerospora disease which is confined to cane subjected to inundation and has been recorded only in Australia, Peru and Louisiana. [But see next abstract. See also *H.A.*, 23: 1345.]

4408. Orian, G.
**Sclerospora disease of sugarcane in Mauritius.**
*Rev. agric. Maurice*, 1954, **33**: 64-72, bibl. 4, illus.

Sclerospora disease was first observed in Mauritius in July 1953 and is not expected to be of economic importance. An account is given of the symptoms on M.134/32 and of inoculation experiments.

4409. Lo, T. T.
**Leaf scorch disease of sugarcane and its control in Taiwan.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 886-91, bibl. 2, illus.

Notes are given on leaf scorch (*Stagonospora sacchari*). Control measures adopted include trash burning, regular removal of diseased leaves during the dry season, use of the resistant N: Co. 310 variety, and disinfection of setts with 0·1% Granosan.—Taiwan Sugar Exp. Stat., Pingtung, Taiwan.

4410. MATHES, R., AND OTHERS.
**Current status of sugarcane-insect investigations in the United States.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 560-7.

Control of *Diatraea saccharalis*, *Elasmopalpus lignosellus*, the vectors of sugar cane mosaic (*Hysteroneura setariae*, *Aphis maidis*, *Toxoptera graminum*, *Carolinaia cyperi*), the vector of chlorotic streak (*Draeculacephala portola*), and wireworms and other soil pests.

4411. WOLCOTT, G. N.
**Residual effectiveness of insecticides against soil-inhabiting insects.** [Spanish summary 1 p.]
*J. Agric. Univ. Puerto Rico*, 1954, **38**: 108-14, bibl. 3.

In tests made 3 years after the first application the following insecticides were found to have retained their efficacy against the sugar cane pests specified: (1) chlordane—*Diaprepes abbreviatus* grubs; (2) BHC gamma isomer—*Phyllophaga* spp.; (3) Aldrin and DDT—*Diaprepes* and *Lachnosterna* spp. Chlordane appeared, however, to have lost much of its toxicity to *Phyllophaga* spp.

4412. ANON.
**USDA research shows soil treatment with chlordane boosts sugar yields.**
*Sugar J.*, 1954, **16** (10): 32.

In experiments by the U.S. Department of Agriculture on sugar cane on heavy soils in Louisiana 1% chlordane dust applied at 2–4 lb. actual chlordane per acre to open furrows containing setts raised both cane and sugar yields by 12% and showed an even more pronounced carry-over effect on the first ratoon crop. The chlordane acts by preventing root-feeding injury and thus checks the entry of wound parasites. [See also *H.A.*, 24: 3238.]

4413. WILLIAMS, J. R.
**Estimating the larval populations of *Clemora smithi* in sugarcane fields.**
*Rev. agric. Maurice*, 1954, **33**: 74-7, bibl. 1.

As the rows in an infested field include the greater part of the field population of *Clemora smithi* larvae, the degree of infestation can be satisfactorily determined by estimating row population. The sample unit adopted is a 3-foot length of cane row, 20 samples being taken per field. A count is made of the grubs on the cane together with those revealed by superficial digging under and round the former positions of the uprooted stools. The probable limits of error inherent in this sampling technique have been calculated.

4414. GALLO, D.
Infestação da broca nas principais variedades de cana. (**Borer infestation in the principal sugar cane varieties.**) [English summary 9 lines.]
*Rev. Agric. Piracicaba*, 1954, **29**: 149-55, bibl. 4.

Of the 6 cane varieties most commonly grown in the Piracicaba area, one of the chief sugar producing regions of Brazil, C.B. 36-24 is the least subject to attack by *Diatraea saccharalis*. The other varieties in increasing order of infestation are Co. 421, Co. 413, Co. 290, Co. 419 and C.P. 27-139.

4415. BANGDIWALA, I. S., AND MARTORELL, L. F.
**Correlation between stalk and joint infestation by sugarcane moth-borer, *Diatraea saccharalis* Fabricius.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 593-601.

A preliminary investigation showed that there is a direct relationship between joint and stalk infestation by *Diatraea saccharalis*. The rate of joint infestation can therefore be found by determining the percentage of stalks bored, a much more rapid method than that of determining the percentage of joint infestation.—Rio Piedras agric. Exp. Stat., Puerto Rico.

4416. MATHES, R., INGRAM, J. W., AND CHARPENTIER, L. J.
**A method for determining losses caused by the sugarcane borer.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 614-16.

Investigations by the United States Department of Agriculture in Houma, La, showed that for each 1% of joints bored there was an average reduction of 30·3 lb. of sugar per acre. Examples of sugar losses per 1% joints bored in 1946 ranged from 70 lb. per acre in Co. 290 to 20 lb. in C.P. 34/120. [See also *H.A.*, 24: 3239.]

4417. LUKE, W. J., Jr.
**Further studies on the control of *Heterotermes cardini* (Snyder), a new pest of sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 582-6, bibl. 3.

In the Dominican Republic 2 lb. aldrin per acre applied as a spray has given effective control of severe infestations of *Heterotermes cardini* in small-scale field trials. Conclusions are that economic control and eradication may be possible.

4418. GUAGLIUMI, P.
El escarabajo rinoceronte o "coco", *Podischnus agenor* (Oliv.), plaga de la caña de azucar en Venezuela. (**The rhinoceros beetle, *Podischnus agenor*, a pest of sugar cane in Venezuela.**) [English summary 2½ pp.]
*Bol. téc. Inst. nac. Agric. Maracay* **8**, 1954, pp. 42, bibl. 20, illus.

An account is given of the stem-boring rhinoceros beetle (*Podischnus agenor*), an increasingly serious pest of sugar cane in Venezuela. Control by chemical, biological and cultural methods is discussed. There is no satisfactory chemical method of controlling the adults. For control of the grubs and pupae frequent thorough cultivation and good drainage are recommended.

4419. MUKERJI, S., AND PRASAD, V. G.
**The present systematic position of the sugarcane leafhopper *Pyrilla perpusilla* Walker.**
*Curr. Sci.*, 1954, **23**: 193-4, bibl. 12.

Studies indicate that the 3 species of *Pyrilla* recorded as being common pests of sugar cane in India are, in fact, merely seasonal colour variations of the one species *P. perpusilla*.

4420. Mungomery, R. W.
**The rise and fall of the sugarcane weevil borer pest in Queensland.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 586-93, bibl. 4.

Pre-harvest burning, which was introduced during the war in place of harvesting green, has reduced the once-serious pest *Rhabdoscelus obscurus* to very minor importance.

4421. Guagliumi, P.
El saltahoja de la caña de azucar, *Saccarosydne saccharivora* Westw., y la fumagina en Venezuela. (**The sugar cane leaf hopper, *Saccharosydne saccharivora*, and sooty mould in Venezuela.**) [English summary 1½ pp.]
*Bol. téc. Inst. nac. Agric. Maracay* **7**, 1953, pp. 82, bibl. 86, illus.

This paper concerns the sugar cane leaf hopper (*Saccharosydne saccharivora*), the injury it causes and the secondary injuries it induces, namely sooty mould or black blight due to *Meliola* sp., and red rot (*Physalospora tucumanensis*). Control by biological, cultural, mechanical and chemical means is discussed. Recommended cultural control measures are thorough cultivation of poorly drained plots, and leaving trash unburned as a harbour for the leafhopper's natural enemies. BHC was the best of several insecticides recently tested and gave 100% control of nymphs and adults in 24 hours.

4422. Andrade, A. C., and Puzzi, D.
Experiências com inseticidas orgânicos para controlar o "percevejo castanho" (*Scaptocoris castaneus*) en cana de açucar. (**Experiments on the control of *Scaptocoris castaneus* in sugar cane with organic insecticides.**)
*Biológico*, 1953, **19**: 187-9, bibl. 1.

Six organic insecticidal dusts were compared in experiments at Ribeiro Preto in 1952. They were applied in the furrow before planting, with or without fertilizer. The plots treated with 10% chlordane, lindane containing 7% gamma isomer, and 10% chlorinated camphene at 120 g. per 20 m. of furrow gave the highest yields. [See *H.A.*, 23: 4062 for the results of previous experiments.]

4423. Coleman, R. E.
**Respiration losses in harvested sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 261-7, bibl. 9.

Investigations on harvested cane of 12 C.P. and Co. varieties at the U.S. Sugar Plant Field Station, Houma, Louisiana, in 1949/51 revealed differences in respiration rate between the top and bottom of the stalks and between varieties. Sugar losses from respiration amount to 1 lb. per ton of cane and could be reduced by storing harvested cane at a low temperature and by expeditious milling.

4424. Waddell, C. W.
**Stale cane losses.**
*Sugar J.*, 1954, **17** (1): 29-33.

The changes in weight and recoverable sugar content of cane, mainly Q.50, Q.28 and P.O.J. 2878, were studied in experiments made in 1951 in the Mackay district of Queensland where it is the practice to burn cane before harvesting. The results and conclusions were: (1) in the comparatively dry weather conditions of the tests the net money loss to the grower between burning and milling averaged 9d. a day per ton of cane when this was cut immediately after burning and left on the ground, but the additional cost of making more frequent burns must be set against this; (2) there was no great difference between losses in early, mid- and late season; (3) cutting immediately after burning is advisable regardless of length of delay anticipated as cane burned and left standing shows a rapid drop in C.C.S.; (4) green cane deteriorated faster than burnt cane under the same conditions even though weight loss rate was lower. Graphs show net money losses under various conditions and weight and C.C.S. changes after burning.

4425. Roberts, E. J., and Martin, L. F.
**Identification and determination of non-nitrogenous organic acids of sugar cane by partition chromatography.**
*Analyt. Chem.*, 1954, **26**: 815-18, bibl. 17.

A method is described which has made it possible to separate and identify the following 9 non-nitrogenous acids in sugar cane juice: syringic, mesaconic, fumaric, succinic, glycolic, malic, citric, oxalic and aconitic, the last being the dominant compound in all samples tested. Comparison between the juices of 7 different varieties showed differences between the total concentrations of these acids, but the relative proportions of individual acids were approximately the same in the different varieties.—S. reg. Res. Lab., New Orleans, La.

4426. Khanna, K. L., and Chacravarti, A. S.
**The non-sugars in sugarcane juice and their bearing on clarifying properties: a study in relation to the open pan industry.**
*Proc. Indian Acad. Sci., Sect. B*, 1951, **33**: 204-20, bibl. 36.

The juices of 8 sugar cane varieties Co. 313, 383, 453, 513 and Bo. 3, 10, 11, 24 were extracted, boiled and analysed. From the results obtained the varieties were grouped according to 3 characteristics associated with superior clarifying qualities and high quality of end product, namely low non-protein and high protein N counts, distribution of total mineral content so that relatively smaller proportions occur in the colloidal fraction, and low levels of soluble silica, iron and aluminium oxides and magnesia in the juice.—Central Sugarcane Res. Stat., Pusa.

## *Tea.*

(*See also* 3388, 4446s, 4447 l, 4493, 4494 l.)

4427. Gokhale, N. G.
**Natural factors and their influences on tea production.**
*World Crops*, 1954, **6**: 280-3, illus.

The factors considered are soil, climate, altitude, topography and aspect, as they affect yield and quality of tea grown in N.E. India.

4428. Denham, G. C.
**The tea industry in Indonesia.**
*World Crops*, 1954, **6**: 314-16, illus.

Notes are given on West Java as the centre of production, estate and peasant-grown tea, rehabilitation of the industry since the Japanese invasion, severe blister blight damage since 1950, and the not very rosy future outlook. In 1952 tea estates covered only 55% of the pre-war area. Present export production is about 80 million lb. and seems unlikely to increase markedly in the near future.

4429. Keegel, E. L.
**Vegetative propagation of tea—the manufacturing aspect.**
*Tea Quart.*, 1953, **24**: 82-9.

The importance of considering the manufacturing qualities of tea in selecting bushes for vegetative propagation is stressed. The technique adopted by the Tea Research Institute, Ceylon, for testing leaf from individual bushes is described in detail.

4430. Jayaraman, V.
**Some aspects of tea manuring.**
*Bull. U.P.A.S.I. sci. Dep. Tea Sect.* **12,** 1954, pp. 4-9.

*Rate of potash manuring with special reference to plant population.* In a manurial trial running since 1940 the effect of K on yield was first seen in 1948. Between 1949 and 1953 the plant population, which had been 2,000 in 1940, fell from 94% to 55% in the nil K plots, from 96 to 80 in the 20 lb. K per acre plots, and from 99 to 96 in the 40 lb. K plots. Under dry climatic conditions K deficiency led to scorching and wilting of the leaves and ultimately to the death of the bushes. *Nitrogen and organic matter content of tea soils.* The results of experiments are given. From these it is concluded that tea requires N and K together. *Moisture content of manures containing urea.* Urea's hygroscopic properties limit its value as a tea manure. Experiments showed that mixtures containing more than 20% urea become wet, sticky and lumpy during the rains. *Nitrification of groundnut cake in tea soils.* Experiments showed that, contrary to the belief in some quarters, groundnut cake is not slow-acting. Some 60% of its original N became available within a month.

4431. van Zuilen, E. J.
Practijkkwesties bij de bemesting van thee. **(Practical considerations in tea manuring.)** [English and Indonesian summaries ¼ p. each.]
*Bergcultures*, 1954, **23**: 351-7, bibl. 5.

In Indonesia where the rainfall is comparatively evenly distributed throughout the year, manuring of tea may take place in any season. In Java, where 2 applications are usually made each year, one should be made not less than 6 months before pruning, and the other not less than 4 to 5 months after pruning. Broadcasting followed by forking in, or manuring in siltpits are recommended as practical methods of application.—Proefstat. C.P.V., Bogor.

4432. Portsmouth, G. B.
**Potash deficiency in tea.**
*Tea Quart.*, 1953, **24**: 79-81, bibl. 1, illus.

A manurial experiment on the potash requirement of tea has previously been reported [see *H.A.*, 20: 3342]. On plots which have had no potash for 22 years severe deficiency symptoms are evident. Foliar analysis figures from potash and no-potash plots show that the potash content of the leaf is directly dependent on the amount of K supplied as fertilizer.

4433. Rose, E. S.
**A note on lime washing.**
*Tea Quart.*, 1953, **24**: 94-6.

The use of imported high grade and local lime was compared in a trial of lime-washing to control moss and lichen on lightly-pruned tea bushes. Despite the higher cost of imported lime, the over-all cost per acre was less as the result of lower labour costs for spraying.

4434. Venkataramani, K. S.
**The principles of tea root disease control.**
*Bull. U.P.A.S.I. sci. Dep. Tea Sect.* **12,** 1954, pp. 12-17.

Notes are given on the primary and secondary root diseases of tea in Southern India and their control. D-D is undergoing preliminary trials with a view to the fumigation of diseased areas. In experiments it had a partially sterilant effect on the soil and encouraged *Trichoderma viride* which, in fumigated but not in unfumigated soil, quickly invaded buried roots and killed *Fomes noxius*.

4435. Minamikawa, J.
**Control of *Ceroplastes rubens* Maskell in Shizuoka Prefecture by a parasite transported from Fukuoka, Kyushu.**
*Tea Res. J.*, 1954, **3**: 11-17, bibl. 15, illus.

Releases of *Anicetus ceroplastis* were made annually from 1950 to 1953 in 4 tea gardens in Shizuoka Prefecture. Rates of parasitism of *Ceroplastes rubens* reached 22% in May/June 1953 in 2 gardens and heavy mortality among the scales in one of these 2 gardens was observed in October 1953.

4436. Laycock, D. H.
**The mineral constituents of some Nyasaland tea leaves and tea soils.**
*J. Sci. Food Agric.*, 1954, **5**: 266-9, bibl. 8.

Analyses of the mineral constituents of some tea leaves and tea soils from one Nyasaland estate were made during investigations into the cause of a disorder of tea bushes, involving loss of newly developing leaves and die-back of new shoots. The analytical work was supported by injection and spraying experiments in the field. Results showed that there is probably no serious disturbance in the mineral balance. The purpose of the paper is to record a catalogue of analytical results, of which there is no previous record for Nyasaland.

4437. Kawai, S., and Ishigaki, K.
**The content of manganese in tea leaves and tea garden soils.** [Japanese, with English summary ¼ p.]
*Tea Res. J.*, 1954, **3**: 71-4, bibl. 15.

Leaf manganese varied with variety and age, being greater in older than in younger leaves, and appeared to be most closely correlated with reducible Mn in the soil.

4438. Torii, H., and Kanazawa, J.
**Detection of sugars in tea leaves by paper chromatography.** [Japanese, with English summary ¼ p.]
*Tea Res. J.*, 1954, **3**: 57-61, bibl. 9.

The following sugars were detected: glucose, fructose, sucrose and two unknown oligosaccharides as free sugars; glucose, rhamnose, galactose, and arabinose as the components of glycosides; glucose, galactose, arabinose, xylose, mannose, rhamnose, galacturonic acid and four unknown uronic acids as the components of water-soluble polysaccharides; ribose and desoxyribose as the components of nucleic acids; and glucose, galactose, arabinose, xylose, fructose, rhamnose, glucuronic acid and another unknown uronic acid as the components of hemicelluloses.

4439. Bokučava, M. A., Popov, V. R., and Sidorov, V. S.
**Chromatographic separation of free amino-acids in fresh and withered tea leaves.** [Russian.]
*Doklady Akad. Nauk S.S.S.R.*, 1954, **95**: 609-10, bibl. 7, illus.

In fresh tea leaves 8 free amino-acids were identified by paper chromatography while in withered leaves a further 2, leucin and phenylalanin, were found together with an increased quantity of all the others. The importance of withering and the role played by leucin and particularly phenylalanin in the formation of aroma in black tea are pointed out.

### *Sundry crops.*

(*See also* 4446q, w, x, z, 4447v, 4494b.)

4440. Noonan, J. C.
**Review of investigations on the *Annona* species.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 205-10, bibl. 24, illus.

Notes are given on the performance of the following species in Florida: cherimoya (*A. cherimola*), ilama (*A. diversifolia*), soursop (*A. muricata*), custard apple (*A. reticulata*), sugar apple (*A. squamosa*) and atemoya (a cherimoya × sugar apple hybrid). The literature and Florida experience are briefly reviewed with regard to pollination, climatic and soil requirements, improvement by selection, propagation by cuttings and grafting (using the pond apple, *A. glabra*, as a rootstock), value and uses, and diseases and pests.

4441. Haiek, I.
Contribuição ao estudo bromatologico de *Averrhoa carambola* Linn. (**Contribution to the bromatological study of *Averrhoa carambola*.**)
*An. Fac. Farm. e Odontol. Univ. São Paulo*, 1952, **10**: 125-33, from abstr. in *Biol. Abstr., Sect. D*, 1954, **28**, No. 6909.

The fruits of *Averrhoa carambola* trees growing near Santos, Brazil, contained 50% dry weight of reducing sugars and were rich in ascorbic acid and in minerals such as K, Ca, Mg, and P.

4442. Lewis, Y. S., and Johar, D. S.
**A case of fruit "rot" caused by yeast.**
*Sci. and Cult.*, 1954, **19**: 559, bibl. 3, illus.

A yeast, probably *Hanseniaspora velbyensis*, was responsible for a white rot on the ridges of unripe green fruits of *Averrhoa carambola*.—Centr. Food tech. Res. Inst., Mysore.

4443. Singh, K. K., and Mathur, P. B.
**Studies in the cold storage of cashew apples.**
*Indian J. Hort.*, 1953, **10**: 115-21, bibl. 4, illus.

The cashew apple (the swollen stalk of the cashew fruit) can be stored for about 5 weeks at a temperature of 32–35° F. and a relative humidity of 85–90%. Changes in the percentages of extractable juice, soluble solids, reducing sugars, acidity and ascorbic acid during storage at different temperatures are recorded.

4444. Sambamurty, K., and Ramalingam, V.
**Preliminary studies in blossom biology of the jack (*Artocarpus heterophyllus* Lam) and pollination effects.**
*Indian J. Hort.*, 1954, **11**: 24-9, bibl. 6, illus.

Data are presented on the production of male and female inflorescences, times of anther dehiscence and periods of stigma receptivity. In preliminary hand-pollination trials the use of pollen from the same parent produced heavier fruits than did a mixture of jack and breadfruit pollen.

4445. Padmanabhan Nambiar, K. P.
**Note on the performance of sapota (*Achras zapota*) on three rootstocks at the Agricultural Research Station, Taliparamba.**
*S. Indian Hort.*, 1954, **2**: 62.

At the end of 2 years in an observational trial sapodillas grafted on *Mimusops hexandra* had made considerably more growth than trees grafted on sapodilla seedlings. Out of 24 grafts of each combination casualties were 1 and 2 respectively. Comparable grafts of sapodilla on *Bassia longifolia* made growth intermediate between that of the other combinations, but casualties numbered 11 and graft unions showed pronounced distortion. Attempts to graft sapodilla on to *Mimusops elengi* failed.

### *Noted.*

4446.

a de Alba, J., and others.
Valor nutritivo de la cáscara de cacao para produccion de leche en comparación con maíz molido y harina de yuca. (**Nutritive value of cacao meal as dairy cattle fodder compared with ground corn and cassava meal.**) [English abstract 11 lines.]
*Turrialba*, 1954, **4**: 29-34, bibl. 9.

b Alexander, W. P., and Spillner, E.
**Seven years' experience with sugarcane-pineapple rotations.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 267-9.
In Hawaii.

c Anon.
**Cane sugar industry in the Belgian Congo.**
*Sugar J.*, 1954, **17** (2): 30.
A single plantation operating since 1925.

d Anon.
Organisatie en taak der Rubber-Stichting (Delft). (**Organization and activities of the Rubber Institute (Delft).**) [English summary 1½ pp.]
*Bergcultures*, 1954, **23**: 279-83, 295-6.

e Arthur, H. R., and Hui, W. H.
**Triterpene acids from the leaves of *Psidium guaijava*, L.**
*J. chem. Soc. Lond.*, 1954, No. 5, pp. 1403-6, bibl. 5.

f Athrey, N. B.
**Coffee industry in Nilgiris.**
*Horticultural and Economic Plants of the Nilgiris*, reprinted in *Plant. Chron.*, 1954, **49**: 128-31.
History, cultivation, cropping, shade and research.

g Birkett, L. S.
**The variety and fertilizer position of the sugar industry, XIX.**
*Sugar Bull. Brit. Guiana Dep. Agric.* **22,** 1954, pp. 55-65.

h Birkett, L. S.
**Report on the sugar experiment stations for the year 1953.**
*Sugar Bull. Brit. Guiana Dep. Agric.* **22,** 1953, pp. 67-71.

i Bonnet, J. A., and Riera, A.
**Sugarcane absorbs phosphorus from tagged superphosphate added to a phosphorus-fixing latosol.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 139-44, bibl. 11.

j Brett, P. G. C.
**A note on stimulation of rooting in detached sugarcane stalks by means of the proprietary fungicide "Aretan".**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 462-3, bibl. 1.
Two experiments suggest that aretan stimulates rooting in cuttings of Co. 301.

k Buzacott, J. H.
**The parental performance of some sugarcane varieties in Queensland.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 485-91, bibl. 2.

Compagnon, P.
Note sur l'Institut des Recherches sur le Caoutchouc en Indochine. **(Note on the Research Institute for Rubber in Indochina.)**
*Bergcultures*, 1954, **23**: 258-9, illus.

m Crowther, P. C., and others.
**Dried pineapple segments from Kenya.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 69-75.
Although of fair quality their future in the U.K. does not seem bright.

n Evers, E.
Une méthode efficace pour la protection des plantules d'hévéa après repiquage au champ. **(An effective method of protecting *Hevea* seedlings after planting out.)**
*Bull. Inf. INEAC*, 1954, **3**: 141-6, illus.
Placing an 8-inch length of bamboo over each plant.

o Gonzalez Rios, P.
**The use of a sprayer in the pollination of sugarcane.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 366-71.

p Govindachari, T. R., Pai, B. R., and Narasimhan, N. S.
***pseudo*Carpaine, a new alkaloid from *Carica papaya* L.**
*J. chem. Soc. Lond.*, 1954, No. 6, pp. 1847-9, bibl. 6.

q Haarer, A. E.
**The cashew nut.**
*World Crops*, 1954, **6**: 95-6, 98, bibl. 6, illus.
See *H.A.*, 23: 4721.

r Haarer, A. E.
**Recent research on Arabian coffee.**
*World Crops*, 1954, **6**: 317-20, bibl. 5, illus.
East African research reviewed.

s (Indian Tea Association.)
**Tea tasting terms.**
*Ser. Indian Tea Ass. sci. Dep.* **69/1,** reproduced in *Plant. Chron.*, 1954, **49**: 323-30.
Definitions are given of 119 terms.

t Innes, R. F.
**An introduction to the sugarcane agriculture of Jamaica.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 328-58, bibl. 10, maps.
A comprehensive account.

u Kenya Coffee Board.
**Annual report and accounts of the Coffee Board of Kenya for the year ended 31st March, 1954.**
*Mon. Bull. Coffee Bd Kenya*, 1954, **19**: 107-13.

v Lagesse, R. P., Lincoln, J. E., and Wiehe, F.
Visite à l'Île de la Réunion. **(A visit to Réunion.)**
*Rev. agric. Maurice*, 1954, **33**: 81-9.
Notes on crops, including sugar cane and essential oils.

w Lakshminarayan Rao, M. V., Subramanian, N., and Srinivasan, M.
**Free amino acids in tamarind pulp.**
*J. sci. industr. Res., India*, 1954, **13B**: 377-8, bibl. 5, illus.

x Lewis, Y. S., Dwarkanath, C. T., and Johar, D. S.
**Utilization of tamarind pulp.**
*J. sci. industr. Res., India*, 1954, **13A**: 284-6, bibl. 14.
As a source of tartaric acid, pectin, alcohol, and potassium bitartrate.

y LUKE, W. J., Jr.
**Soil groups of the coastal plains in the Dominican Republic and their response to sugarcane varieties and fertilizer.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 183-8, bibl. 9.

z MACFIE, G. B., Jr.
**Wines from tropical fruits.**
*Proc. Fla St. hort. Soc. for 1953*, pp. 263-8.
Using orange, guava, antidesma, elderberry, carissa cherry and Barbados cherry.

4447.

a MITRA, M. N.
**Early history of sugar cane and sugar.**
*J. agric. Soc. Trin. Tob.*, 1954, **54**: 39-41.
In India back to 400 B.C.

b MURRAY, W.
**Mechanized replanting.**
*Plant. Bull. R.R.I.M.*, 1954, No. 13, pp. 68-72, illus.
Operations and costs on a rubber estate.

c NIRULA, K. K., ANTONY, J., AND MENON, K. P. V.
**The flying fox (*Pteropus edwardsii*)—a pest of coconut palm in India.**
*Indian Coconut J.*, 1954, **7**: 71-6, bibl. 7, illus.
Concussion by means of explosives a possible method of control.

d PANDALAI, K. M., SANKARASUBRAMONEY, H., AND MENON, K. P. V.
**On the use of filter press mud from sugar factories as a source of potash and ameliorant for coconut soils.**
*Indian Coconut J.*, 1953, **7**: 20-5, bibl. 23.
Analytical data.

e PEARSON, C. H. O.
**The general practice and procedure in the cane fields of South Africa.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 248-51.
[See also *H.A.*, 23: 4656.]

f PEMBERTON, C. E.
**Sugar cane quarantine in Hawaii.**
*Sugar J.*, 1954, **17** (2): 12, 14.
Notes on system in operation for 30 years.

g RAJAGOPALAN, T. S.
**Select references on guava (*Psidium guajava* Linn.).**
*S. Indian Hort.*, 1954, **2**: 63-6, bibl. 86.
A bibliography.

h RANJAN, S., KOTHIYAL, M. D., AND PRAKASH, A.
**Studies on plant growth in relation to different soils and manures. II. Manurial properties of mango seed kernel.**
*Proc. Indian Acad. Sci., Sect. B*, 1951, **33**: 288-9, bibl. 1 [received 1954].

i RAYMOND, W. D., AND SQUIRES, J. A.
**Coffee from St. Vincent.**
**Hybrid coffee from St. Vincent.**
*Colon. Plant Anim. Prod.*, 1954, **4**: 53-4 and 55-6.
Quality of arabica good, but that of the hybrid (liberica × arabica?) less so.

j ROJAS, B.
**Design of a sampling for the estimation of degree of intensity of borer attack.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 310-17, bibl. 5.
Devised by the Oficina del Campos Experimentales, UNPASA, Mexico.

k RUBBER RESEARCH INSTITUTE OF MALAYA.
**Dry rubber content of latex.**
*Plant. Bull. R.R.I.M.*, 1954, No. 13, pp. 74-6.
Simple instructions for determination.

l SAKAMOTO, Y.
**On the chemical changes of the tea components in the manufacture of black tea** (continued). [Japanese, with English summary $\frac{1}{4}$ p.]
*Tea Res. J.*, 1954, **3**: 50-6, bibl. 5.
Catechins and amino acids in fresh and manufactured leaf from 3 crops.

m SAMUELS, G., AND CAPÓ, B. G.
**A survey of the agronomic practices in growing sugarcane in Puerto Rico in 1952.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 240-7, bibl. 4.

n SANTO DOMINGO, J. P.
**On the determination of fibre in cane.**
*Sugar News*, 1954, **30**: 220-1, bibl. 4.
A criticism of the method mentioned in *H.A.*, 24: 2079 l.

o SCHMID, V.
Het algemeen proefstation der A.V.R.O.S. te Medan. **(The general A.V.R.O.S. experiment station at Medan.)**
*Bergcultures*, 1954, **23**: 255-8, illus.
A short history of this rubber research station.

p SINGH, R. N.
**Hybridization and mango improvement.**
*Indian J. Hort.*, 1954, **11**: 16-18, bibl. 10.

q SMITH, R. H.
**The phosphatides of the latex of *Hevea brasiliensis*. 2. Purification and analysis.**
*Biochem. J.*, 1954, **57**: 130-9, bibl. 25.
[For Part 1 see *H.A.*, 24: 2032.]

r SMITH, R. H.
**The phosphatides of the latex of *Hevea brasiliensis*. 3. Carbohydrate and polyhydroxy constituents.**
*Biochem. J.*, 1954, **57**: 140-4, bibl. 25.

s SYLVAIN, P. G.
**Long-range objectives in studies of the physiology of coffee.** [Spanish summary 11 lines.]
*Turrialba*, 1954, **4**: 13-22, bibl. 38.
A review of, and suggestions for, research.

t TANGANYIKA.
*A.R. Government Chemist, Tanganyika, 1953*, 1954, pp. 13, 1s.
Studies on coffee black tip (nutritional) disease.

u TUCKER, R. W. E.
**Biological control of insect pests in Barbados.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 573-81.
*Diatraea saccharalis*, *Diaprepes abbreviatus* and *Clemora smithi*.

v VENKATARAMANI, K. S.
**Notes on some common Crotalaria. II. *Crotalaria grahamiana.***
*Plant. Chron.*, 1954, **49**: 343-5, illus.

w WALTER, N.
**The sugar industry in Egypt.**
*Sugar J.*, 1954, **17** (2): 30-1.
Notes on acreage, cultural practices, yields, etc.

x WANG, S. C.
**Taiwan sugarcane soils and fertilizers.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 177-82, bibl. 9.
Artificial fertilizers and organic and green manures.

y WISMER, C. A.
**Stem gall development on sugarcane, variety 44-3098, following insufficient soil moisture.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 943-51, bibl. 11, illus.
In Hawaii.

z WOLCOTT, G. N.
**The residual effectiveness of insecticides against soil-inhabiting insects.**
*Proc. 8th Congr. int. Soc. Sugar Cane Tech., 1953*, 1954, pp. 617-21, bibl. 2.
Including *Diaprepes abbreviatus* and *Phyllophaga* (*Lachnosterna*) spp.

## NOTES ON BOOKS AND REPORTS.

### *Books.*

4448. ALLERTON, F. W.
*Tomato growing.*
Faber & Faber, London, 1954, 8×6 in., pp. 196, illus., 18s.

This is a practical and comprehensive book which should interest all progressive growers of tomatoes in the glasshouse. The various preparations necessary and subsequent culture for a successful crop are given in detail. It is perhaps significant that the first chapter concentrates on glasshouse hygiene, a most important point that is sometimes overlooked. The successful culture of tomatoes is inseparably bound up with freedom from pests and diseases, which is largely dependent on hygiene and good cultural practice. The importance of many factors connected with propagation are expounded; among the more recent developments, the use of different temperatures before and after germination and artificial illumination at the seedling stage are of some consequence. The advantages and disadvantages of various types of pot are discussed; it would appear that one of the greatest advantages of the soil block over the clay pot has been sacrificed where the peat block or "pot" is used, since the amount of compost in the peat block is considerably reduced. Another disadvantage may be the difficulty of moistening peat blocks if they become dry. The use of "ring" culture, or bottomless pots on ash or similar material, is a new and interesting venture and may be one answer to the rising cost of soil treatment by steam or chemicals. The advice on growing the plant and feeding throughout the season is concise. The author wisely leaves the choice of variety to district preferences, and concludes with some comments on the outdoor culture of the tomato in the U.K., which will appeal to growers and amateurs in areas favoured with a suitable climate.
M.M.M.

4449. BALZAK, S. S., VASYUTIN, V. F., AND FEIGIN, YA. G. (Editors), and HARRIS, C. D. (American Editor).
*Economic geography of the USSR.*
Macmillan, New York, 1949, second printing 1952, 8½×6 in., pp. xlv+620, figs 84, bibls numerous, 70s. or $10.00.

The original work, of which this volume is the English translation, was published in 1940, and therefore does not include the great changes which occurred in the 1941 to 1945 period. In 7 chapters the natural resources and agricultural and industrial production of the U.S.S.R. are detailed against a background of the topography and geography of the country. The distribution of agriculture is described over some 100 pages, and all major agricultural, industrial and plantation crops, vegetable and fruit production and viticulture receive individual treatment.

For the horticulturist the excellent climatic and ecological descriptions of the various regions will be of interest in the light of present investigations in the U.S.S.R. on vegetable, orchard and plantation crops. A number of indexes covering plants, animals and place names, a table of equivalents, list of abbreviations, transliteration table, glossary of Russian terms, and supplementary maps have been added for the benefit of non-Russian readers.
E.U.

4450. BARBER, A. C.
*Annual flowers.*
Faber & Faber, London, 1954, 9×6 in., pp. 278, illus., 25s.

The book is divided into two parts, the first dealing very fully with the cultivation and uses of annuals in the flower garden, while Part 2 lists most of the species and their best garden varieties available today. This list, a miniature encyclopaedia of some 1,400 species and varieties, will delight the curious gardener with a preference for unbeaten tracks, for besides the usual run of popular kinds to be found in every garden he will surely discover many intriguing names which will convey no picture at all. The remedy is obvious, for there is no thrill in gardening to compare with that of flowering an unfamiliar plant for the first time. A minor, but interesting, feature is a brief explanation of the meaning and origin of each generic name. Cultural and descriptive notes are given in all cases. Classified lists are provided to the number of 23, the groupings being those of colour, height, and plants for various soils and purposes. A resounding name does not necessarily mean that its owner is equally impressive and, to prevent disappointment among those who still believe there is something in a name, the author has provided a selection of little-known but attractive annuals which are both colourful and free flowering and can be grown with confidence. Though many books have been written on annuals at one time or another, this must be quite one of the most complete.

G.St.C.F.

4451. Barker, B. T. P.
*Cider apple production.*
*Bull. Minist. Agric. Lond.* **104**, H.M.S.O., Lond., 2nd edition 1954, pp. 64, illus., 3s.

This long looked for publication discusses questions of particular interest and importance to producers of cider apples. So far as the reviewer is aware, the first edition, published in 1937, has been unobtainable since about 1940. In the meantime, the production of cider apples has altered materially and Professor Barker is particularly well qualified to describe these changes.

Throughout the country the cider apple growing community, mostly farmers, has always been confronted with apparently insuperable difficulties, hence the more scientific and practical advice forthcoming the better. This bulletin is useful, not only to the practical grower and cider maker, but also to the agricultural and horticultural adviser.

What must impress the reader, especially in comparison with the first edition, is the meticulous care with which the author deals with the newest information on soil management and manuring, and on the control of pests and diseases, and his fine presentation of varietal characters of cider apples. What little information there is on pollination is given, as also on bush tree plantations as an alternative to the standard tree orchard.

Looking at our old cider orchards one feels that most of them would benefit from many of the practices here described, while the production of abundant supplies of good vintage varieties would satisfy growers and cider makers alike. For these two very sufficient reasons all the interests concerned should make the best use of the accumulated knowledge which has been acquired through both practice and science, much of which is covered by this bulletin. Prior to and during World War II, many farmers took more interest in their cider orchards, but the phase is passing, as it has frequently done in the past. One feels that Professor Barker had this in mind in his preface when he wrote that the existing situation as regards supplies of fruit affords an opportunity to press on with the reorganization of the cider industry.

Under existing conditions the cider factory's task is made unnecessarily difficult by the miscellaneous character of the consignments sent in. This is a direct result of the multiplicity of varieties, which in their turn contribute towards our very low yields; thus by planting and grafting with varieties of proved merit, growers' yields and profits would improve and the requirements of the factory be better met. Too strong a plea cannot be made for judicious manuring, especially the correction of nitrogen deficiency, as the systems generally practised fall very short in the maintenance of fruitful grass orchards, or for varieties with the greatest resistance to insect and fungous attack, especially canker. Growers need to be told more of the economic merits of these varieties.

As their main problem is the extent to which expenditure can be economically related to crop value and orchard welfare, growers would be well advised to take guidance from the information contained in this bulletin.

C.S.

4452. Brooks, R. M., and Hesse, C. O.
*Western fruit gardening.*
University of California Press, Berkeley and Los Angeles; Cambridge Univ. Press, Lond., 1954, 9½×6 in., pp. 287, illus., $4.50 or 34s.

The Western gardener is the gardener of Washington, Oregon, California and Arizona and his climatic conditions differ very widely. Hence the first piece of information given is a table showing where all the different fruits discussed are likely to grow with varying degrees of success within those territories and where they certainly will fail. Practical hints follow on good cultivation methods. Notes given on the time generally taken to reach bearing age and on life expectancy will be extremely useful to the garden planner. The line drawings helpfully adorn the text which, however, would be lucid even without them. There is an attractive section on different budding methods and on different modes of training fruit species. A final—not very full—chapter is entitled "Troubles of fruit plants" and in it the reader is sensibly told to consult the experts at the Agricultural Colleges and the Agricultural Extension Services.

In between, some 180 pages are devoted to notes on 49 individual fruit species, varieties or strains. At one end of the scale are the apple, gooseberry and cherry, at the other white sapote, *Casimiroa edulis*, and the delectable, frost-shy macadamia, *Macadamia ternifolia*. The book contains in fact a most interesting collection of useful and fascinating articles so that one longs for the climate that will support the growing of fruits, "some of which have a beautiful orange-red rind, a delicious rich flavor and plenty of juice. Some people prize tangelos above all other citrus fruits". We should like to have the chance!

But are not the authors just a little unjust to the poor mulberry?

D.A.

4453. Childers, N. F. (Editor), and 27 others.
*Mineral nutrition of fruit crops.*
Horticultural Publications Rutgers Univ., New Brunswick, N.J., 1954, 8½×6½ in., pp. 907, bibls, illus., $10.00.

The editor has rendered a conspicuous service to horticulture by bringing together under one cover the considered opinion of scientists in North America or what one might call salient features of modern research on fruit plant nutrition.

Each of the 18 chapters is compiled by one or more persons whose names appear regularly in accounts of research in different fields, and most of the compilations have been further scrutinized by other workers in the U.S.A. or Canada.

Every chapter is worth far more than an abstract to itself, being an up-to-date review by an expert, but since our considered advice to the scientist, adviser and student is to get the book at all costs, probably our most useful present action is merely to list the subjects which are so lucidly discussed in this clearly printed work. Each chapter has its list of references, and at the end of the book are subject and author indexes referring to all citations in the book. Separate chapters deal with the nutrition of: apple, avocado and mango, blueberry and cranberry, other bush fruits, cherry, citrus—with separate chapter on leaf analysis of citrus—grape vine, edible nuts, peach, pear, plum and prune and apricot, strawberry, tung. A special section, pp. 344–476, is devoted to the photographic representation of symptoms occurring in fruit trees caused by deficiencies in boron, calcium, copper, iron, nitrogen, magnesium, manganese, molybdenum, potassium, sulphur, zinc, and those due to abnormal pH in soil, excess chlorides, defects in blueberry soil media, insufficient winter chilling, arsenic injury, and soil compaction. Further chapters concern: the role of isotopic tracers (pp. 17), chelated metals (pp. 36), experimental layout (pp. 25) and mineral contents of fruit plants (pp. 23).

The citation of some of the authors' names and initials in the index is curious rather than accurate. D.A.

4454. Corbet, H. A.
*Fodder trees.*
H. A. Corbet, 44 Angelo Street, Perth, W.A., 2nd edition [1954?], pp. 20, bibl. [annotated] 36, 5s. Aust.

In this enlarged and amended second edition the author discusses 59 species of fodder trees, noting their habitat, characteristics, feeding value, etc. [For first edition see *H.A.*, 22: 746.]

4455. Freeport Sulphur Company (Tuller, W. N., Editor).
*The sulphur data book.*
McGraw-Hill Book Co. Inc., N. York, London, 1954, 9½×6 in., pp. 143, bibl. 43, $5.

It is stated that the book offers working material, not a literature survey, to the engineer and chemist using sulphur. It is based on the experience of the company and on a selection of what are believed to be the most accurate data available. Its sections are entitled: The nature of sulphur, Physical and chemical properties, Reaction thermodynamics, Solubility, Analysis of sulphur. The book contains Sulphuric Acid conversion tables and an index. It does not deal with the uses of sulphur.

4456. Hellyer, A. G. L.
*The encyclopaedia of garden work and terms.*
Collingridge, London, 1954, 8½×5½ in., pp. 288, illus., 21s.

Sanders' indispensible *Encyclopaedia of Gardening* [*H.A.*, 22: 3184], to which this volume is complementary, tells the reader what to do in the cultivation of some thousands of plant varieties, but not how to do it. The aim of the present volume is to fill the gap and to explain the many technical terms peculiar to the craft of gardening. Ambitious though the claim may seem, it has been so well fulfilled that, though gardening still remains a craft, it should be, for readers, a craft without a mystery. The book contains everything a beginner will need to know and much that the more expert should know but quite possibly doesn't. For instance, various aspects of garden chemistry receive close attention and the incorporation of the more useful findings of modern horticultural research will be found to be fully up to date. The many illustrations are all to the point and provide a useful adjunct to the text. The arrangement is alphabetical and cross references are somewhat infrequent, so that, as in the case of any encyclopaedia without an index, certain subjects have to be reached by the method of indirect approach, which is a little difficult for a beginner who may be not quite sure what he is looking for. However, if he has to read through the book to find out, he will certainly emerge a more instructed person whether successful in his quest or not. Flippancy apart, this is a very worthy book and one that can be whole-heartedly recommended. G.St.C.F.

4457. Kristensen, R.
*Dyrkning af køkkenurter.* **(Vegetable growing.)**
Almindelig dansk Gartnerforening, Copenhagen, 1954, 9×6½ in., pp. 424, bibl. 364, illus., Kr. 33.50.

This book is published under the auspices of the Danish Horticultural Society and is written by a lecturer of the Veterinary and Agricultural College, Copenhagen, who is familiar with the topical problems of vegetable research at home and abroad. Following a discussion of general principles (pp. 136) he deals in turn with individual vegetables arranged in groups, such as perennials including strawberries and rhubarb, leaf vegetables, root vegetables, legumes, cucurbits, etc., and finally with herbs. Appropriate sections of the impressive bibliography, which contains many references to Bulletins and Annual Reports, complete each chapter. A vocabulary of vegetable crop names in 6 languages, besides scientific names, and a subject index conclude the manual.

4458. Krüssmann, G.
*Die Baumschule.* **(The nursery.)**
Paul Parey, Berlin and Hamburg, 1954, 10×7½ in., pp. 559, bibls extensive, figs 359, DM. 48 cloth or DM. 44 paper.

Books, like implements, acquire during manufacture certain characters associated with the country of their origin. *Die Baumschule* is no exception and, rather like its namesake, is set out section by section in rows, well trimmed, labelled and carefully indexed, so that the nurseryman or reader may readily find items of special interest with the minimum of effort.

The nursery industries of the principal countries are briefly reviewed; it is noteworthy that the only country providing inadequate statistics is our own, and this may perhaps excuse the low estimate of nursery areas in the United Kingdom. The first section of the book deals with the general aspects of nursery work, establishment of the nursery including site factors and equipment, nursery techniques and management, grading, packing and trade conditions, diseases and pests and their control. Then comes a comprehensive list of plants with appropriate methods of propagation and hints on special treatments; broad-leaved and coniferous plants are listed separately. Finally there are some really useful appendices including regulations and agreements of the nursery trade, in particular the quality grades and labels in use for various plants, a list of 38 plant collections in Germany together with their nature, and finally a short list of technical terms and their equivalents in thirteen languages.

There is timely appreciation of mechanical equipment, from portable floating pumps through hand tools and grafting machines to mechanical planters and tree lifters. Mechanization is essential in the modern commercial nursery and its increasing importance is stressed.

The author hopes that in describing modern theory and practice he has served both. This work is certainly well furnished with up-to-date information, supplemented with ample references and illustrations for the student; the tree and shrub nurseryman is probably better supplied with practical nursery information than ever before within a single volume. As always, one can point to omissions and errors. For treatment of cuttings with synthetic hormones, for instance, powder application is advocated; the simpler and more accurate quick-dip treatment is not mentioned. The vegetatively propagated Marianna plum rootstock is, by mischance, placed with the seedlings.

Such recent techniques as the X cuttings of Floor, the double-shield budding of Garner and Nicolin, and the use of plastic films in propagation and for packing are clearly described. It is therefore somewhat surprising that the word "virus" is not even whispered, and this at a time when the impact of these diseases on the nursery trade gives concern to all, and, moreover, demands some overhauling of nursery methods and of the standards required to achieve certification.

*Die Baumschule* is international in outlook and we must all regret that it is not available in our own tongue. Many in the shrub and the nursery trade will fret until an adequate translation becomes available.

R.J.G.

4459. Morettini, A.
*Olivicoltura.* **(Olive growing.)**
Ramo Editoriale degli Agricoltori, Rome, 1950, 10×7 in., pp. 585, bibls, illus., Lire It. 2800.

An English textbook on the olive has still to make its appearance. Meantime we must content ourselves with useful occasional short articles issued by investigators in California or Departments of Agriculture in Australia or, alternatively, learn Italian. We have in Morettini's careful work not only the author's own very considerable experience in olive research but his careful examination of the contributions of other authorities in France, Spain, North Africa and elsewhere. The book is clearly and thoughtfully illustrated and it should be useful no less to the grower as a practical guide and reference book than to the investigator who wants to know how far progress has reached in any particular field of endeavour. The author deals in turn with history and statistics of production, cultivation throughout the world, the Oleaceae, morphology and biology with special emphasis on flower and fruit, biennial bearing, wild olives, cultivated varieties, climate and soil, propagation, nursery work, planting, manuring and cultivation, choice of varieties and spacing, transformation of stands of wild olives into olive groves, soil management, pruning at all stages, restoration of neglected groves, harvesting and storing, pests and diseases. He does not deal with processing.

D.A.

4460. Quenouille, M. H.
***The design and analysis of experiment.***
Chas. Griffin & Co. Ltd., London, 1953, 9×6 in., pp. 356, bibl. 36s.

The critics who maintain that all books on statistics are the same except for the order of the chapters should read this one, for it is a most distinctive production, the differences in the main being for the better. It is not clear to what class of reader the book is addressed, but it should be stated right away that it will not suit the beginner; for one thing, words are sometimes used in some undefined sense personal to the author (the word "experiment" in the title is an example of this), and for another, the quality is uneven, some subjects, such as missing plot technique, being dealt with inadequately, while others, such as the effect of the failure of whole treatments, are examined with enthusiasm and much detail. Also, the extensive bibliography is rather queer, ending as it virtually does in 1950 and having no perceptible connexion with the text. On the other hand, for anyone who has already had some experience this is a most sprightly and stimulating publication, for the outlook is original, the examples apt and the whole text charged with that common sense that comes from actual contact with experiments as opposed to lecturing on the mathematical theory of statistics.

One especially admirable feature is the emphasis on the need to examine the raw data as a preliminary to analysis. One delightful example is afforded by a trial on peas in which four levels of a fertilizer, including none at all, were applied using three methods of placement, and the experimenters had assumed that no fertilizer would necessarily give the same result whatever the placement method. As Mr. Quenouille points out, however, their own data suggest that this is not so, the disturbance of the soil itself having an effect on germination. Incidentally, he does not point out the moral that the trial could usefully have included a genuine nil treatment, but this omission is not characteristic. His comments on the example are full and informed.

Also of especial value is the section on "long term policy", which starts off on its stated subject, but soon develops into an exceedingly valuable discussion on the problems of designing and analysing groups of experiments, whether carried out at one time or in sequence, this being one of the most useful parts of the book. Also, there are some good methods of examining the residual effects of treatments as well as immediate ones, a comprehensive discussion of the uses of transformations, an ingenious and simple method of dealing with an experiment in which a treatment has been applied in error to the wrong plots, and much else. Where the author is interested he writes clearly and with originality, and if he links these excellent isolated essays with passages that at times do little more than present a continuous façade and occasionally reveal a surprising gap, he will be readily forgiven. The reviewer does not know everything either, and it is a long time since he read a statistical book with so much enjoyment, or one from which he has learnt so much, or one more calculated to get him out of a rut, and he is grateful to Mr. Quenouille for the experience. S.C.P.

### *Annuals and reports.*

4461. Barbados.
***Annual Report of the Department of Science and Agriculture, Barbados, for the year 1951-1952*** [1954?], pp. 89.

*Sugar cane breeding.* Outstanding varieties tested were B.4744, B.47419, B.4738, B.4747, B.47258, B.47380 and B.47314. The first 2 were superior to the standard canes, B.37161 and B.4098. *Botany.* Propagation and distribution of ornamentals, vegetables, citrus and tropical fruit trees. *Chemistry.* Studies showed that the much lower response often evoked by January applications of ammonium sulphate to sugar cane on coralline soils than by June applications is due to loss of volatile ammonia nitrogen under conditions of soil moisture loss. In other trials cane again showed no significant response to K or P. *Entomology.* Effective control of the sugar cane stem borer, *Diatraea saccharalis*, with the egg parasite, *Trichogramma minutum*, was maintained. The development of a technique for the control of the grubs of the cane root borer, *Diaprepes abbreviatus*, and the brown hard-back, *Clemora smithi*, by soil insecticides is in progress.

4462. Biologische Bundesanstalt f. Land-u. Forstwirtschaft, Braunschweig (Richter, H.).
*Jahresbericht der Biologischen Bundesanstalt für Land- und Forstwirtschaft in Braunschweig.* **(Annual Report of the Biologische Bundesanstalt, Braunschweig, for 1952)**, 1954, pp. 108, bibls, illus.

The general report of the Biologische Bundesanstalt includes the reports of the 14 institutes in Western Germany which are branches of the central institute at Braunschweig. Most of the horticultural items briefly discussed have been the subject of papers already abstracted or noted in *Horticultural Abstracts.*

4463. Brandon.
***Progress Report Dominion Experimental Farm, Brandon, Manitoba, 1948-1952,*** 1954, pp. 46, illus.

*Meteorological data* (pp. 5-8). *Horticulture* (pp. 24-5). Varieties of some 30 vegetables produced satisfactory crops; determinate type tomatoes are preferred to the indeterminate, or staking varieties, because of their ability to ripen a larger proportion of their fruit. Surviving ornamental trees and shrubs, most of which were planted before 1900, have proved very hardy. Yearly average frost-free days for 62 years are 95 and of killing-frost-free days (28° F. or lower) 121 days.

4464. British Honduras.
***Report of the Department of Agriculture, British Honduras, for 1952,*** pp. 25.

A clear idea is given of the present position and changes in progress with regard to the production of the more important crops. Among them are: citrus (increased exports noted), coconuts (revival of exports noticeable), bananas and plantains, ramie, sugar and rum, cohune (nut cracking problem not yet solved), cacao and pineapples.

4465. California Department of Agriculture.
***Thirty-fourth Annual Report of the State of California Department of Agriculture, period ending December 31, 1953,*** issued as *Bull. Calif. Dep. Agric.*, 1953, **42**: 174-499, illus.

*Bureau of Entomology:* Pear psylla (*Psylla pyricola*) was reported for the first time in California. The oriental fruit fly (*Dacus dorsalis*) infestation danger seemed to be reduced. *Bureau of Plant Pathology:* Virus disease surveys on fruit trees. Fungus diseases reported for the first time in California included *Sclerotium rolfsii* on *Philodendron cordatum* and *Streptomyces scabies* on turnips. *Bureau of Weed Control:* A longevity test on *Halogeton glomeratus* showed that papery bract seeds were viable for less than 2 years, those with hard bracts germinated only when the bracts were removed; tests on their viability continue. A low volatile ester of 2,4-D showed promise of controlling leafy spurge (*Euphorbia esula*). Biological control of klamath weed (*Hypericum perforatum*). *Bureau of Chemistry:* Fertilizer production. Three and a half million acres were treated by aircraft for agricultural pest control in 1953.

4466. Canada.
***Annual Report Fruit and Vegetable Products Research Committee, Department of Agriculture, 1953,*** pp. 220.

Brief reports, some of which are abstracted separately, are presented from various research centres in Canada on storage (pre-storage factors, harvesting, grading and packaging, and storage environment) and processed foods.

4467. Commonwealth Scientific and Industrial Research Organization, Australia.
***5th Annual Report C.S.I.R.O. for the year ending 30 June 1953,*** Canberra, 1953, pp. 191, 11s.

*Plants:* introduction; genetics; microbiology; fruit investigations; oil crop investigations; tobacco; plant nutrition; weed control. *Irrigation. Entomology:* biological control; insects and viruses. *Food:* fresh fruit and vegetable storage and transport; canning and fruit products; dehydrated foods; dried vine fruit. *Plant fibres. Meteorology:* frost prevention. [For details see separate abstracts in the relevant sections.]

4468. East Malling.
***Annual Report of East Malling Research Station 1953,*** 1954, **A37**, pp. 232, 12s. 6d., U.S. $2.00.

The report, as before, consists of 4 parts: I. Notes on the experimental farm. II. A general review of research work completed and in progress in the various sections. III. Separate research papers. IV. Bulletins for fruit growers. Part II records the establishment of a new series of fruit storage investigations that are being conducted in collaboration with Ditton Laboratory (D.S.I.R.), in which the effects of field factors on storage quality are to be studied. [See separate abstracts of the papers in Parts III and IV.]

4469. FAO.
*Trabajos tecnicos. IV. Conferencia Interamericana de Agricultura. Segunda Reunión Regional Latinoamericana para la Agricultura y la Alimentación.* **(Technical Studies, being Fourth Inter-American Agricultural Conference and Second Latin-American Regional Meeting of FAO.)** Barreiro y Ramos S.A., Montevideo, 1950, pp. 546, bibls [received 1954].

Some 50 papers were read at the Conference. They include one on the introduction of better varieties of fruit plants to Chile, by the Chilean delegation, which gives a brief account of the fruitgrowing regions of Chile and lists the chief varieties of deciduous fruits, nuts and citrus; and another on coffee pulp as stock feed, by the Interamerican Institute of Agricultural Sciences, Turrialba, Costa Rica.

4470. FAO.
***Yearbook of Food and Agricultural Statistics, 1953. Vol. VII, Part I. Production.*** [English, French and Spanish], Rome, 1954, pp. 334, $ 3.50 or 17s. 6d.

Section III includes data on acreages and production in FAO countries of many vegetable, fruit and plantation crops. Section VI gives production and consumption figures for commercial fertilizers. Pesticide consumption tables have been discontinued for the present. World market prices for 1934-52 are listed in Section VII, and include those for cane sugar, citrus fruit, dried fruit, oilseeds, fats and oils, coffee, cacao, tea, tobacco, some fibres and rubber.

4471. GEISENHEIM (STEINBERG, J.).
*Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau Geisenheim am Rhein. Bericht für das Rechnungsjahr 1952/53.* **(Annual Report of the Geisenheim Horticultural College and Research Station for 1952/53),** [1954?], pp. 89, bibl. numerous.

The reports submitted by the 12 departments of the research station discuss research projects in hand and refer to results that have recently been published. [For details of work not previously recorded in *H.A.* see abstract 3774.]

4472. INSTITUUT VOOR DE VEREDELING VAN TUINBOUWGEWASSEN, WAGENINGEN.
*Jaarverslag Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen, 1951-1952,* 2. **(Second Annual Report of the Institute for the Breeding of Horticultural Crops, 1951-1952),** 1954, pp. 151, illus., f. 3.50.

This report covers all the extensive breeding and selection work on fruit, vegetables and herbs being done at this Institute. In the physiology section mention is made of the following: higher % germination of cherries by embryo culture, chromosome studies, the vegetative propagation of some vegetables and fruits, and colchicine treatment of brassicas, asparagus, herbs and top fruit. In the section on the propagation of woody plants summaries are given of experiments on fruit tree rootstocks, walnut and hazel propagation, scion cuttings, layering and the propagation of adult plants by root-suckers in the juvenile phase. There is also a short section on taxonomical studies of ornamentals. Particular crops are arranged alphabetically, with summaries of the progress in current projects; these include many varietal trials and breeding programmes, fruit set in the strawberry variety Jucunda, seed production of brassicas, qualities of cooking pears, the influence of spacing and sowing or planting on the seed harvest of radishes, the relation between carotene content in carrot leaves and roots, colchicine treatment of *Delphinium* species, the production of very early ripening tomatoes, seed harvest surveys for beet, onion and carrot, an economic survey for walnuts, and growing and breeding problems for herbs.

4473. I.R.S.I.A., BELGIUM.
*Rapport annuel de l'Institut pour l'Encouragement de la Recherche scientifique dans l'Industrie et l'Agriculture, Exercice 1953.* **(Annual Report of the Institute for the Encouragement of Scientific Research in Industry and Agriculture, 1953),** Brussels, 1954, pp. 201.

The research programmes subsidized by the Institute are summarized in this administrative report. They include investigations on plant growth substances, sand culture, the cultivation and preservation of vegetables, the culture of ornamental plants and strawberries, viticulture and hop research.

4474. LACOMBE.
***Progress Report Dominion Experimental Station, Lacombe, Alberta, 1947-1952,*** 1954, pp. 56, illus.

*Meteorological records* (pp. 6-12). *Horticulture* (pp. 39-44). Information is provided on the most suitable varieties of trees, shrubs, flowers, fruit and vegetables for Lacombe conditions, where figures over 45 years show the average yearly number of frost-free days as 81 and of killing-frost-free days (28° F. or lower) 116.

4475. LETHBRIDGE.
***Progress Report Experimental Station, Lethbridge, Alberta, 1947-1952,*** 1954, pp. 51, illus.

*Climate* (pp. 5-8). *Horticulture* (pp. 28-32). Tomato breeding, selection and cultivation; in 1951 and 1952 during prevailing westerly winds in unprotected areas some tomato varieties did not mature. The tenderometer and texturometer proved reliable instruments for determining the maturity of processing peas. For strawberries, frequent light irrigations appeared more beneficial than fewer heavy irrigations.

4476. MADRAS, DIRECTOR OF INFORMATION AND PUBLICITY.
***Agricultural research in Madras State [1947-50],*** Govt Press, Madras, 1952, pp. 43.

Work has concerned: *Castor bean* breeding. *Coconuts:* disposal of husks by burying below the trees, growth of subsidiary crops, breeding and selection. *Sugar cane:* testing new canes, ratooning practice, irrigation, biological control of *Argyria sticticraspis* by *Trichogramma. Mango:* identification and nomenclature of South Indian varieties, regulation of growth tendencies by cultural means. *Citrus:* shield bud method of propagation made standard practice. Jamberi and acid lime used as rootstocks for Sathgudi promoted vigorous growth. Wood apple [*Feronia elephantum*] as a rootstock induced good quality and yield of fruit up to about 12 years but had to be discarded owing to its extreme dwarfing effect on scions. *Other hill fruits.* Cultural practice generally.

4477. MADRAS DEPARTMENT OF AGRICULTURE.
***A short note on the salient points of the 3-year programme of the Agricultural Department for the years 1950-53,*** pp. 22.

This should be used in conjunction with the bulletin on agricultural research in Madras State [see preceding abstract]. As regards crop improvement it is noted that research on the more important commercial fruits of the plains is carried out at Kodur and that on hill fruits in the Nilgiris stations at Coonoor, Kallar and Burliar. It is also stated that it is proposed to test bananas from South and other parts of India for their economic qualities at the Central Banana Research Station [Aduthurai?]. Investigations are noted at Gudiyattam on sugar cane, at Taliparamba on chillies and other crops, at Pattambi on ginger, chillies, etc., at Palur on fruits, at Lam on chillies, at Ambalaval, Wynaad, on mandarin oranges and pineapples.

4478. MINISTRY OF AGRICULTURE, HASHEMITE KINGDOM OF JORDAN.
***First Annual Report 1952 of the Agricultural Research Service,*** Deir Alla Research Station, [1953?], pp. 20.

Work on vegetables includes the observation of imported and local varieties. Among introduced onions only Ailsa Craig seemed likely to compete with the local type.

4479. N.A.A.S.
***Station Guide 1954 with Progress Report 1952-3, Bryn Adda Horticulture Demonstration Station,*** Bangor, pp. 24.
***Station Guide 1954 with Progress Report 1953-4, Cleppa Park Horticulture Demonstration Station,*** Newport, pp. 24.
***Station Guide 1954, Efford Experimental Horticulture Station,*** Efford, Hants., pp. 37.
***Station Guide 1954, Fairfield Experimental Horticulture Station,*** Esprick, Kirkham, Preston, Lancs., pp. 16.
***Station Guide 1954, Luddington Experimental Horticulture Station,*** Luddington, Stratford-on-Avon, Warwickshire, pp. 18.
***Station Guide 1954, Stockbridge House Experimental Horticulture Station,*** Cawood, Selby, pp. 30.

The station guides of these new N.A.A.S. establishments [see also previous notices, *H.A.*, 24: 1062-5 and others] serve in these earlier years as progress reports giving a clear account of work in progress at the different centres.

4480. NAALDWIJK.
*Jaarverslag over 1953 van het Proefstation voor de Groenten- en Fruitteelt onder Glas te Naaldwijk.* **(Annual Report for 1953 of the Research Station for Fruit and Vegetable Growing under Glass, Naaldwijk)**, 1953, pp. 72.

Studies were continued on the water economy of cauliflower and tomato. *Manurial trials* continued with grapes, peaches, tomatoes, lettuces and cauliflowers. *Cultural experiments* were continued with mushrooms, flowers, melons, grapes, tomatoes and lettuces, on the vernalization of endive, artificial illumination of tomatoes, cucumbers, lettuces and chrysanthemums, sugar sprays for strawberries, and the use of hormones on tomatoes, melons, lettuces, strawberries, plums and grapes. *Breeding and selection* of grapes, tomatoes, calceolarias, and cinerarias. *Variety trials* with eggplants, cauliflowers, lettuces, spinach, melons, strawberries, beans and sprouts. *Cool storage trials* with grapes. *Pest and disease control experiments* on various crops. [See also separate abstracts.]

4481. NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE.
***Guide to varieties of field and vegetable crops under trial, observation and propagation, 1954,*** Cambridge, 1954, pp. 78.

Vegetables include broccoli, sprouts, cabbage, cauliflower, kohlrabi, legumes, lettuce, onions, radish, swedes and tomatoes.

4482. NEW SOUTH WALES.
***Annual Report of the N.S.W. Department of Agriculture for 1952-53,*** 1954, pp. 84, illus., 7s. 6d.

*Division of Plant Industry.* Tobacco breeding. Hop trials. Vegetables—breeding, variety trials, disease resistance, processing, harvesting, minor element nutrition, krilium tests with vegetables, weed control. *Horticulture.* Citrus—storage diseases control, packs, breeding, foliar nutrition, preharvest drop control. Banana—disease and pest control, plastic bunch covers, irrigation and fertilizer trial, trace elements, hormone sprays for plantation destruction. Pineapple and mango—frozen produce. Pome fruits—rootstocks, disease control, foliar nutrition, thinning sprays, preharvest drop control sprays, breeding, bumpiness in Williams' pears, storage. Stone, dried, berry and miscellaneous fruits and nuts—breeding and selection, apricot internal breakdown, peach pruning, green manure and cover crops, canning, rootstocks, foliar nutrition, variety and stock trials, vine delayed budburst, currant vine cincturing, trace elements, quick-freeze research, cultural trials of youngberry, boysenberry and loganberry, grape vine affinity, spacing and packing trials. *Division of Science Services.* Disease and pest control in fruit, vegetables and ornamentals, chemical residues on crops.

4483. NEW YORK STATE.
***72nd Annual Report New York State Agricultural Experiment Station, 1953,*** Geneva, 1954, pp. 23.

Recent research contributions treated briefly in this report include: reports on parathion resistance in European red spider, and DDT resistance in cabbage caterpillar; 1 pint of 25% parathion emulsion per acre gave 99·5% control of pea weevil; the antibiotic actidione at 2 p.p.m. was found to control cherry leaf spot fungus when sprayed after an infection period of 4 days; dry stem on English Morello cherries was almost eliminated by substituting methoxychlor for lead arsenate in the spray programme. Current station projects and publications are also listed.

4484. ONTARIO DEPARTMENT OF AGRICULTURE (VINELAND).
*Report of the Horticultural Experiment Station and Products Laboratory [Vineland] for 1951 and 1952,* pp. 93, illus.

This biennial report includes the work of the Horticultural Experiment Station under 3 divisions—Research, Breeding and Variety Testing, and Extension, and the first substantial report of the Horticultural Products Laboratory, established in 1950. Most of the papers from the Research and Products Laboratory sections have been abstracted separately. The report on variety and breeding includes a summary of pear breeding since 1913 and notes on edible nuts, ornamentals, grapes, and jointless-stem tomatoes.

4485. PURDUE UNIVERSITY.
**Progress of Agricultural Research in Indiana,** being *66th Annual Report of the Director, Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1953,* pp. 148, illus.

*Horticultural crops:* the performance of East Malling dwarfing rootstocks and their propagation from cuttings and layers; breeding of scab resistant apples; studies on the control of cherry virus diseases; breeding of rust and wilt resistant mints; increasing peppermint (*Mentha piperita*) yields; soil fumigation and weed control in melons; placement of phosphates for tomatoes; controlled water level in muck soils; apple orchard cultivation experiments. *Insect and rodent control:* control of maple bladder gall (*Phyllocoptes quadripes*); experiments to prevent aphid and mite build-up on Dutch elm after DDT sprays; strawberry pests control; mint pests. *Basic science and agriculture:* studies on physiology and fruiting of plants; breeding tomatoes of high vitamin and carotene content.

4486. "THE RHODESIAN FARMER."
*The Rhodesian Farmer Year Book,* Salisbury, Dec. 1953, pp. 262, illus., £1 1s.

The first issue of a yearbook on the agriculture of the Federation of the Rhodesias and Nyasaland is a useful reference work, covering all the main fields of agriculture practised. Articles likely to be of particular interest to the readers of *Horticultural Abstracts* are those on the following: Electricity, Experiment and research, Fruit growing, Fruit marketing, Fungicides, Insecticides, Irrigation, Marketing tobacco, Nyasaland crop production, Plant diseases, Sugar production, Tea, Tobacco industrialists, Tobacco marketing, Tobacco Marketing Board, Tobacco Research Board, Tobacco Virginia, Tobacco Turkish, Vegetable marketing.

4487. TUNISIE, SERVICE BOTANIQUE ET AGRONOMIQUE.
*Rapport sur les Travaux de Recherche effectues en 1953.* **(Report on research work in Tunisia conducted in 1953),** pp. 183 (cyclostyled).

Information summarized in this report includes: *Fruit tree growing.* Processing tests at Kasserine in connexion with the reorganization of the apricot industry. *Plant Genetics Laboratory.* Castor and broad bean variety trials. *Agricultural Chemistry Laboratory.* Water requirements of young sour orange. *Market-gardening Crops Laboratory.* Tomato: selection of processing varieties and introduction of early varieties. Tobacco: selection of nicotine-poor and nicotine-rich varieties. Introduction of pea, french bean and lima bean. *Agricultural Entomology. Ceratitis* bait studies and chemical control of larvae. Biological control of bean aphis (*Aphis rumicis*). *Fruit growing Laboratory.* Variety collections. Pistachio budding. Apricot breeding. Olive: local varieties, multiplication. Almond: search for nematode-resistant rootstock. *Olive and Fruit Tree Research Station.* Regeneration of olive plantations by interplanting rooted cuttings, by replanting, and by severe pruning; olive variety collection. *Viticultural Laboratory of the Colonial School of Agriculture.* Study of wine and cultural characters of different varieties; variety trials at different places. *Sidi Tabet Irrigation Experiment Station* (established 1953). Olives and apricots with and without annual inter-crops, citrus, market garden crops.

4488. U.S. DEPARTMENT OF AGRICULTURE.
*Agricultural statistics 1953.*
U.S. Govt Printing Office, Washington 25, D.C., 1953, pp. 777, $2.25.

World and U.S. production figures and acreages are given for the past 10 or more years for all types of agricultural produce, including cane sugar and tobacco pp. 87-107; oilseeds, fats and oils pp. 120-45; fruits, vegetables, melons, tree nuts and beverage crops pp. 156-284.

4489. U.S. DEPARTMENT OF AGRICULTURE (TRULLINGER, R. W.).
*Report on the Agricultural Experiment Stations 1953,* 1954, pp. 177.

The more important research projects of the Federal Stations are summarized. They include: *Tobacco:* the optimum time for harvesting burley tobacco in Tennessee was 25 days after topping; higher yields of cigar tobacco were obtained by placing half the fertilizer in the furrow and harrowing half into the top soil. *Vegetables:* yields of tomatoes, snap beans, cucumber and sweet potatoes were increased by supplementary irrigation in Mississippi. In California the optimum spacing for lima beans was found to be 4 inches. *Ornamentals:* In Mississippi grafting of small camellias was more successful with potted plants than with bare-rooted understocks. In Alabama fertilizer applied early in the growth of young gladiolus plants delayed production. At Cornell carnations, pompon chrysanthemums, roses, lily-of-the-valley and garden lilies were successfully stored at 31° F., flowers stored dry and wrapped in moisture-proof packages were superior to those stored with their stems in water. *Fruit:* Work in Missouri indicated that chemical thinning of fruit has two physiological effects, (1) temporary retardation of cell division in the abscission layer, (2) strong and prolonged embryo inhibition. Massachusetts workers concluded that N status of an apple tree may be an important factor in determining the amount of thinning necessary. In Idaho NAA gave fairly good peach thinning when applied 4 weeks after flowering. Failure of re-planted peach orchards in Georgia and South Carolina may be due to the soil fungus, *Clitocybe tabescens*, which caused root rot. The productivity of vineyards in Missouri was found to be correlated with the quantity of available P in the top 6 inches of soil. *Diseases and pests:* Studies in Wisconsin into the character of resistance to fusarium wilt in tomatoes showed that it was distributed throughout the plant. In Oregon mahaleb rootstock was shown to be immune to western-X disease. Disease control for low-bush blueberry is being studied in Maine. In Florida, Mathieson 275 fungicide applied to rows at planting reduced root rot and damping off in beans. *Engineering:* New machines include a photoelectric meter developed by the Indiana Station for colour grading tomatoes, and a green asparagus harvester from California.

4490. U.S. Department of Agriculture.
***Report of the Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering 1953,*** 1954, pp. 128.

*Rubber plant investigations:* six top-clones of hevea have continued to show resistance to *Phytophthora palmivora* in "leaf-fall" phase; acetates in nutrient solutions increased the rate of rubber formation in hevea; high-yielding guayule strains for hot climates are being developed. *Tobacco:* 5·4 pints per acre of 30% maleic hydrazide gave better control of sucker growth after topping than oils, but the chemical composition of the leaf was altered; treatments to alleviate hail damage were developed; molybdenum was found to be essential for tobacco plant growth; root-knot nematode and root rot attacks were more severe on plants grown after lespedeza. *Sugar cane:* three uniform and erect varieties suitable for mechanical harvesting have been bred; the practice of "shaving" summer and autumn plant cane caused yield losses of up to 4 tons per acre; varieties C.P. 36/13 and C.P. 44/101 showed considerable frost resistance. *Fruit and nut crops and diseases:* new hosts of X-disease and western-X-disease viruses are listed; 15 p.p.m. of NAA applied to Duchess apples 2 weeks after full bloom initially slowed down fruit growth, but subsequently proved a satisfactory thinner; terramycin and streptomycin were translocated in peach trees causing chlorosis; captan reduced loss by peach anthracnose to 8% from 63% in the control; blossom blast of pears, due to B deficiency, was controlled by autumn and spring sprays of 1 lb. boric acid in 100 gal.; Crag Herbicide No. 1 at 3 lb. per acre used on strawberries 1 month after planting out, gave satisfactory weed control; zinc sulphate applied to pruning wounds of vinifera grapes corrected Zn deficiency; N application to Persian walnuts resulted in increased nut yield, size, and % kernel to whole nut; the propylene glycol ester of 2,4,5-T effectively controlled briars and voluntary tung seedlings in tung orchards. *Vegetable crops and diseases:* bean seeds stored at 60% R.H. and 65° F. showed no loss in viability for several years, but after 2 years there was loss in seedling vigour; the satisfactory ventilation rate for mushrooms was found to be 7 cu. ft. of air per sq. ft of bed. *Basic studies of plant growth and development:* streptomycin was translocated upward in bean plants and 100 µg. completely stopped development of halo blight [*Pseudomonas phaseolicola*] symptoms; translocation of 2,4-D, 2,4,5-T, NAA and IAA in bean plants was accelerated by the presence of B, and was further increased when sugars were added; new compounds to control preharvest drop of apples include 5 chlorinated phenoxyacetic acid compounds; poinsettia plants sprayed in full bloom with 4-chlorophenoxyacetic acid retained their leaves and flowering bracts 2 weeks longer than unsprayed plants; improved rooting of rhododendron cuttings was obtained after treatment with 1% dust of 2,4,5-TP; aqueous sprays of 3-chloro-isopropyl-N-phenyl carbamate showed promise for thinning peach fruits. *Handling, transport and storage:* shipments of tomatoes at 55° to 65° F. showed better ripening and less spoilage than those shipped at lower temperatures; the marketing period for Florida oranges was extended by 2 to 3 months by storage at 32° F. *Ornamental plant crops and diseases:* breeding of tetraploid poinsettias, carnations and Easter lilies; gladiolus corms heat-cured at 90° F. and stored at 40° and 50° F. gave earlier and more flowers than those held at normal temperatures; corms kept at 90° F. for 10 days after storage at 40° F. and then planted out, produced more young corms than those given other storage treatments; root rot of camellia was reduced by soil treatment with copper A, dithane D-14, dowfume MC-2, formaldehyde, shell CPC, shell OS 1199 or vancide before planting; Speciosum lilies stored at 50°, 45°, 35° and 31° F. gave earlier flowering than those stored at 60° F.; early flowering of hydrangeas resulted from storage at 50° to 60° F. for 2 to 4 weeks under low intensity light, followed by storage in darkness at 35° to 40° F. for 6 weeks. *Machinery:* air blast spray control of tomato diseases was limited by lack of positive control of the air pattern; a tung seed-planting tractor attachment has been developed.

4491. Woods, J. J.
**A brief outline of current experimental work.**
*Mimeo. Saanichton exp. Stat., B.C.,* **139,** 1954, pp. 14.

*Nutrition:* Work in progress is concerned with fertilizers for, and mulching, green manuring and irrigation of, horticultural crops and fruit trees. *Fruit crops:* Breeding of strawberries, logans, apples for earliness and disease resistance; variety trials. *Bulbs and ornamentals:* Controlled temperature work, weed control, holly storage, shipping and propagation. *Vegetables:* seed production, cabbage breeding. *Miscellaneous:* cascara cultivation.

## *New and revived periodicals.*

4492. Gartenbauwissenschaft (Gleisberg, W., Editor).
***Die Gartenbauwissenschaft*** [*Gartenbauwiss.*], 1954, Vol. **1 (19),** No. 1, pp. 126, Bayerischer Landwirtschaftsverlag, Munich, volumes DM. 2.60 per 16 pages plus postage, single numbers 25% more.

The reappearance of the *Gartenbauwissenschaft*, 9 years after it ceased publication in its 18th volume, will be welcomed by everyone connected with horticultural science. The aims of the journal remain the same, but its scope will be extended to comprise papers on management, labour and marketing. An abstract section is promised for the future. Publication will be irregular. The new volume appears as a "Jubiläumsband" celebrating the 25th anniversary of the journal's first publication in 1929. We offer our congratulations and best wishes!

4493. TOCKLAI EXPERIMENTAL STATION.
***Two and a bud,*** 1954, Vol. I, No. 1, pp. 13.

Tocklai's new cyclostyled, foolscap-size, non-technical newsletter is addressed "to all who are interested in the growing and processing of tea". The first number consists of 13 pages and contains articles on engineering, withering, potash, chlorocide, manuring on bheel soils, selective weedkillers and mites.

### *Noted.*

4494.

a ***Amateur Gardening Handbooks*** issued by Collingridge, London, 1954, pp. 92 each, illus., 3s. 6d. each.
Simons, A. J. Vegetable growing.
Huxley, A. J. House plants.
Dawson, R. B. Lawns.

b ANDREWS, F. W.
***Vernacular names of plants as described in "Flowering plants of the Anglo-Egyptian Sudan. Vol. II".***
McCorquodale & Co. (Sudan) Ltd., 1953, pp. 89.

c DOMINICA.
***A.R. Department of Agriculture and Forestry for 1952,*** [1954?], pp. 33.
Including banana manurial trials.

d EUROPEAN PLANT PROTECTION ORGANISATION (E.P.P.O.).
***Progress Report of the European Plant Protection Organisation, 1953-54,*** Paris, 1954, pp. 19 [French and English].

c GEORGIA.
**Serving Georgia through Research,** being ***Annual Report of the University of Georgia College of Agriculture Experiment Stations, 1952-53,*** pp. 38.
Lists of projects, publications and personnel.

f MICHIGAN.
***Sixty-sixth Annual Report of the Michigan Agricultural Experiment Station, July 1, 1952 to June 30, 1953,*** Lansing, 1954, pp. 331.

g NATIONAL SHADE TREE CONFERENCE (TILFORD, P. E., Editor).
***Combined Proceedings of 29th National Shade Tree Conference,*** Chicago, Ill., and ***20th Western Chapter National Shade Tree Conference,*** Santa Monica, Calif., 1953, pp. 303, illus.
See separate abstracts.

h NORTHERN RHODESIA.
***A.R. Northern Rhodesia Department of Agriculture for 1953,*** Lusaka, 1954, pp. 27, 2s. 6d. Includes statistics of tobacco production.

i ROTHAMSTED (LAWES AGRICULTURE TRUST).
***Report of Rothamsted Experimental Station for 1953,*** Harpenden, 1954, pp. 227, 7s. 6d.
See separate abstracts.

j SIERRA LEONE.
***A.R. Sierra Leone Department of Agriculture for 1952,*** 1954, pp. 33, 1s. 6d.

k UGANDA.
***Department of Agriculture. Record of Investigations, No. 3, 1950-52,*** pp. 93, shs. 3/50.
See separate abstracts on coffee and banana.

l UNITED PLANTERS' ASSOCIATION OF SOUTHERN INDIA.
***Proceedings of the Second Annual Conference, 1954, of U.P.A.S.I. Scientific Department [Tea Section],*** 1954, pp. 34, being *Bull.* **12.**
See separate abstracts in tea section.

m (VALDEYRON, G.)
Rapport sur les travaux de recherche effectués en 1952. (**Report on research conducted in 1952.**)
*Ann. Serv. bot. agron. Tunis Suppl.*, 1951, **24**: 1-30.
For a detailed report see *H.A.*, 23: 3686.

# INDEX

**H.A. Vol. 24. No. 1.**

N.B.—Brackets round the name denote that this person, although not the author, was directly or indirectly concerned with the article.

Aamlid, K., 468
Abbott, D. L., 174
Abi-Fadel, J. F., 140
von Abrams, G. J., 464
Adam, A., 372a
Adams, R., 615a, 615b
Adams, R. E., 363
Agarwala, S. C., 434
Aghoramurthy, K., 615c
Aguirre, J. T., 228
Airan, J. W., 542a
Akamine, E. K., 940
Akenhead, D., 79a
Alban, E. K., 389
Alderman, D. C., 785
Allard, R. W., 458
Allayyanavaramath, S. B., 1013
Allen, E. K., 34
Allen, O. N., 34
Amico, A., 684
Amin, F. Y., 673
Amsterdam, Royal Institute for the Tropics, 1050, 1061o
Anandan, A. P., 891
Andersen, A. L., 459
Andersen, H., 1061f
Anderson, H. W., 282, 372a
Anderson, J. F., 181
Anderson, L. D., 529
Andrews, P. S., 644
Anon., 67, 77, 79b, 79c, 151, 205, 217, 221, 225, 311, 372b, 372c, 418, 480, 481, 490, 536, 566, 580, 623, 739, 929, 930, 932, 970, 1016a
Apple, S. B., Jr., 467
Araneta, R. R., Jr., 601
Arcihovskaja, E. V., 138
Arisumi, T., 940
D'Armini, M., 570, 571, 577a
Arney, S. E., 212
Arrica, N. N., 238
Arroyave Vargas, G., 375
Asen, S., 697
Askew, H. O., 576
Atkins, E. L., Jr., 799
Atmore, S., 735m
Audus, L. J., 27, 1018
Auxence, E. G., 589
Avidov, Z., 323, 372d, 794
Avramov, L., 227
Ayers, A. D., 486

Bachmann, F., 348
Bacon, O. G., 456
Bagenal, N. B., 1027
Baggiolini, M., 332
Bahtadze, K. E., 1001
Baines, R. C., 795
Baker, C. E., 200
Baker, H. G., 735b
Baker, K. F., 666
Baker, R. E. D., 878, 1016b
Baker, R. S., 29
Bald, J. G., 666, 672
Baldassari, T., 1019
Baldini, E., 89, 123
Banigan, T. F., Jr., 615d
Barbier, M., 941
Bareau, P., 853
Bargioni, G., 267
Barnabas, J., 542a
Barnes, A. C., 1020, 1016c
Barrau, J., 837
Barthelet, J., 635
Bartley, B. G., 1016d
Batjer, L. P., 145
Batra, B., 577b
Batt, R. F., 371
Battaglini, A., 832m
Bawden, F. C., 572
Baxter, L. W., 714
Beach, R. G., 645
Beam, R., 912
Bean, A. G. M., 57, 58
Bean, G., 60, 419
Bear, F. E., 412
Beckham, C. M., 426
Beecher, F. S., 449
Beley, —., 1016e
Benassy, C., 347
Ben-Meir, Y., 793, 832a
Bennett, A. J., 888
Bensa, S., 685
Bentley, J. A., 79d
Beraha, L., 293
Berggren, Å., 7
Bermuda Department of Agriculture, 1061b
Bernstein, L., 486
Bevenue, A., 80i
Bhat, J. V., 581
Bhatia, B. S., 79y
Bhatia, I. S., 543i
Bhatnager, V. B., 477
Biale, J. B., 802, 832o
Bianchi, H., 345
Biddulph, O., 21
van der Bie, G. J., 1016f
Biesalski, E., 72
de Bijl, D., 244c
Billerbeck, F. W., 183
Birchfield, W., 995
Birkett, L. S., 969
Bisaillon, L., 49
Bitters, W. P., 760, 787
Blackmon, G. H., 256
Blakeslee, A. F., 48
Bless, A. A., 80h
Bloch, R., 372e
Blommers, J., 244c
Blondin, P., 79c
Bloom, J. R., 524
Bocquet, —., 954
Boeke, J. E., 78
de Boer, S., 680, 721
Böhm, O., 317
Bohn, G. W., 542b
Boǐčinov, A., 615e
de Boixo, —., 765
Boles, J. N., 754
Bolle, F., 372f
Bolli, M., 560
Bolsunov, I., 554, 562
Bömeke, H., 266
Bomhay, B. B., 527
Bond, J. A. B., 916
Bonner, J., 31, 832o
Bonnet, J. A., 1016g
Borden, A. D., 372g
Bosch, H., 709
Boskoop. See "de Proeftuin"
Bosley, D. A., 735c
Bóttari, V., 812, 832s
Bouat, A., 820
Bould, C., 148, 156, 254, 257
Bouriquet, G., 1016h
Bourne, B. A., 987
Bowers, F. A. I., 828
Bowler, W. W., 1016i
Bowles, E. J., 630, 637
Box, H. E., 994
Boyle, J. S., 372h
Boynton, D., 146
Brantley, B. B., 538
Branzanti, E. C., 201a
Brase, K. D., 120, 127
Breazeale, E. L., 20
Breider, H., 223
Bremen, Rhododendron Gesellschaft, 727
Brenière, J., 991
Breny, R., 343
Breviglieri, N., 201b
Briant, A. K., 886
Bridgers, B., 735d
Brierley, P., 518, 698, 701, 719, 735l
Bringhurst, R. S., 737
British Columbia, Dominion Experimental Station, Prince George, 1048
Broadbent, L., 437
Broertjes, C., 703
Broker, R., 581
Brown, C., 51
Brown, C. P., 832b
Brown, D. S., 140, 162

Brown, E., 579
Brown, E. B., 372i
Brown, J. C., 41, 577c
Brown, J. G., 821
Brown, J. W., 153
van den Bruel, W. E., 313
Brun, J., 849
Bruns, V. F., 390
Brusca, J. N., 738, 777
Buchanan, W. K., 985
Buchholz, W., 73
Buehrer, T. F., 615g
Bullard, E. T., 496
Bullwinkel, B., 33
Bünsow, R., 79f, 735e
Bureau of Agricultural Economics, U.S. Department of Agriculture, 805
Burgess, E., 229
Burgher, A. T., 97
Burke, O. D., 542c
Burkholder, W. H., 647
Burma, D. P., 79g
Bu[singer, J. A.], 69
Busschots, —., 260
Butts, J. S., 467
Byrde, R. J. W., 291

Čaĭlahjan, M. H., 780
Cairaschi, E. A., 372j
Cairns, E. J., 474
Calavan, E. C., 789
Calvino, G. E. M., 817
Camacho, E., 953
Cameron, C., 969
Cameron, S. H., 742
Cameron Brown, C. A., 53
Campbell, A. I., 111
Campos, L., 797
Canada, Minister of Agriculture, 161, 246, 247, 654, 1037
Canham, A. E., 53
Cannon, R. C., 942
Canterbury Agricultural College, N.Z., 1061c
Capoor, S. P., 578, 615f
Capot, J., 599
Carag, A. T., 596
Carbonel, J. R., 919
Carew, J., 405, 542d
Carlson, R. F., 216
Caro, D., 361
Carreker, J. R., 415
Carrier, L. E., 695
Carvalho, A., 904, 909
Castaño A., J. J., 911
Castro, G. P., 600
Cathey, H. M., 640
Cation, D., 300, 304
Catlow, E., 165
Cawthron Institute, New Zealand, 116, 510, 515, 544, 545, 604, 605, 606, 1038
Celjadinova, A. I., 593
Ceylon Director of Agriculture, 833
Ceylon Rubber Research Institute, 948
Chakrabortty, H. C., 79g
Champion, J., 849
Chandler, S., 372k
Chandler, S. C., 316, 350
Chapman, H. D., 757
Chapot, H., 832c
Chase, F. E., 159
Chateau, R., 939
Chatterjee, B. G., 558
Cheshunt Experimental and Research Station, 445, 494, 629, 1061d
Chettiar, T. P. R., 899
Chevrel, J., 372x
Chicago, Library Branch, Quartermaster Food and Container Institute, 201k, 201l, 542v
Child, R., 887, 1016k
Childs, W. H., 356
Chilton, S. J. P., 398
Chopra, I. C., 583, 588
Choudhri, R. S., 477
Chow, N.-P., 1017s
Christopher, E. P., 197, 198, 199
Chu, H. T., 990
Chu, T. L., 966
Chupp, C., 542d
Ciferri, R., 250, 253, 358, 482
Cipolla, G., 807
Clapier, B. A., 978
Clarke, W. S., Jr., 121
Clayton, E. E., 555
Clore, W. J., 390
Coelho, J. M. N. S., 99
Cohen, A., 784
Cohic, F., 1016l
Coit, J. E., 832d
Cole, J. R., 307
Coles, J. V., 535
Collyer, E., 310
Colonial Products Advisory Bureau, 841, 842
Commonwealth Bureau of Plant Breeding and Genetics, 10
Comuzzi, A., 222
Congdon, N. B., 172
Connecticut Agricultural Experiment Station, Storrs, 1061e
Connell, W. A., 364, 542e
Conroy, R. J., 451
Constain, J. C., 871
Contois, D. E., 945
Cook, A. S., 1016m
Cook, J. A., 806
Cooke, G. W., 413
Coombe, B. G., 305
Cope, F. W., 859, 875
Cornell, P. W., 729, 735d
Corns, W. G., 489
Corsten, L. C. A., 79s
Cosmo, I., 222
Costa, A. S., 908
Cox, R. S., 725
Craig, D. L., 207
Crane, H. L., 239
Crane, J. C., 185, 901
Crang, A., 218, 408
Cree, C. B., 832i
Crescimanno, F. G., 237
Crescini, F., 404a
Crocker, C., 543d
Crop Reporting Board, U.S.A., 577d
Crossan, D. F., 453
Crossley, J. H., 655
Cruzado, H. J., 386
C.S.I.R.O., Australia, 135, 195, 235, 382, 546, 758, 1039
Cumberland, R., 244a
Curtis, C. H., 809
Cutright, C. R., 329

Dakers, J. S., 1061a
Dale, W. T., 876
Dallyn, S., 379
D'Amato, F., 461
Danish Plant Service for Seed Pathology, 1061f
Danish Seed Testing Station, 1061g
Darley, E. F., 45
Date, W. B., 190
Davies, J. N., 52, 542f
Davis, T. A., 891
Davison, B. K., 1016n
Davison, J. R., 832e
Dawson, E. H., 425
Dawson, R. B., 394
Day, B. E., 385
Dean, F. P., 330
Deanon, J. R., Jr., 582
Delmas, H.-G., 296
Delp, C. J., 372o
Delver, P., 50
Demoranville, I. E., 181
Dempsey, A. H., 538
Denisen, E. L., 388
Derard, J., 313
Dermen, H., 136
Dermine, E., 101, 126
Dermott, W., 542g
Deshpande, B. D., 658
Desrosier, N. W., 183
Detroux, L., 343
Devuyst, A., 928
Dewey, D. H., 186, 187, 188
DeZeeuw, D. J., 459
Dicarlo, F. J., 1017a
Dicker, G. H. L., 339
Diercks, R., 372m
Diffidenti, G. H., 586
van Dijk, P. J. S., 715
Dimock, A. W., 647
Doidge, E. M., 245
Donno, G., 102, 103, 104, 141
Doolittle, S. P., 518
Doorenbos, J., 79h, 641, 716
Doroszewski, M., 542h
Dorsman, C., 706
Dosse, G., 439
Doucette, C. F., 682
Doutt, R. L., 827
Dragaš, M., 227
Drake, R. J., 832u
Drezgić, P., 56
D.S.I.R., New Zealand, 604
Dufournet, R., 1016o
Dugger, W. M., Jr., 30, 40
Dulac, J., 820
Dumas, M., 201c
Dunegan, J. C., 281, 357, 372l, 372v
Dunlap, V. C., 850, 1017r
Dunn, J. S., 420
Dupaigne, P., 542i
Durocher-Yvon, F., 1016p
Duthie, D. W., 594
van Duuren, B. L., 615a, 615b

Dvori, A., 753
Dye, D. W., 298

Eastwood, T., 392
Eaton, E. L., 202
Eaves, C. A., 196
Ebben, M. H., 528
Ebeling, W., 365, 454, 832f
(Eden, T.), 1000
Edland, H., 1061a
Edwards, R., 160
Eggenberger, W., 231
Ehrenhardt, H., 320, 336, 372m
Ehrle, L., 65
Eifler, I., 79n
van Eimern, J., 264
Eisses, J., 614
Elern, S. J., 404b
Ellenwood, C. W., 201d
Ellingham, G., 192
Ellis, D. E., 453
Elmer, H. S., 796, 798
van Emden, J. H., 959
Emerson, F. H., 289
d'Emmerez de Charmoy, D., 967
Endemann, W., 559
Enikeff, —., 163, 164, 781
Enoch, A., 1016q
Erickson, L. C., 760
Ernst, A., 735f
Evans, H., 861, 866, 867, 868
Evans, H. J., 517
Evenari, M., 416
Evers, E., 1016r
Ewart, W. H., 796, 798

Fabig, F., 502
Fahn, A., 846
Fajardo, P. S., 431
Falch, J., 209
Faljkenšteĭn, B. Ju., 351
Falk, K., 660
Farooq, M. O., 542j
Farr, T. H., 16
Faure, J., 83
Feldmeier, I., 79i
Fennah, R. G., 867
Ferguson, J., 543b
Fernandez-Cano, L. H., 228
Fero, 201e
Ferreira Filho, J. C., 902
Fielding, A. H., 291
de Figueiredo, E. R., Jr., 735g
Filho, H. A., 909
Filocamo, E. F., 373c
Finney, D. J., 1021
Fischer, C., 621
Fisher, D. V., 178
Fjäderhane, A. M., 7
Fleschner, C. A., 752
Floriani, F., 201f
de Fluiter, H. J., 275
Folley, R. R. W., 201g
Ford, H. W., 790
Forsberg, J. L., 665
Forster, W. A., 11, 12
Foster, R. E., 542b
Foster, Z. C., 63
Fox, C. J. S., 542k
Fox, J. M., 233
Fraga, C. A., 1017p
Francesconi, F., 815
Franco, E., 897
Frank, F. A., 615k
Franklin, M. T., 372i
Franssen, C. J. H., 540, 542 l, 898
Franz, J., 372n
French, F. L., 551
Fritsche, —., 498
Frolich, E. F., 736
Frömming, E., 1061 l
Frost, O. M., 82
(Fruhstorfer, A.), 620
Fukunaga, E. T., 810
Fuller, C. E. K., 244b
Fulton, R. H., 277, 304
Furr, J. R., 806
Furuta, T., 643

Gagnotto, A.-V., 671
Gallay, R., 279, 1044
Galston, A. W., 29
Galt, R., 931
Gammon, N., Jr., 256
Gangolly, S. R., 894
Gangstad, E. O., 395, 603
Gard, L. N., 380
Gardner, C. A., 735h, 735i
Garretsen, F., 211
Gaspar, M., 577f
Gauch, H. G., 30, 40
Gaudineau, M., 306
Geier, P., 332, 333, 334
Georlette, R., 79j
Germek, E., 79k
Gerritsen, J. D., 215, 244c
Giesberger, G., 996
Gigante, R., 569
Giggard, E. D., 542t
Gilbert, J. C., 542m
Gillard, S. O., 79q, 406
Gillespie, H. L., 832g
Gillham, E. M., 542n
Giraldi, G., 826
Glendenning, R., 355
Gloyne, R. W., 791
Godfrey, G. H., 785
Godwin, A. E., 436
Golden, A. M., 651
Goldstein, C., 882
Goldstein, H. L., 16
Goodall, G. E., 743, 747
Goor, A., 813
Gordon, A., 982
Gortner, W. A., 381
Gothoskar, S. S., 525
Gould, C. J., 674
Govindan, P. R., 516
van der Graaf, A. J., 374
Graham, T. W., 309
Greene, L., 901
Gregory, F. G., 79m
Gregory, L. E., 953
Grierson, W., 804
Griffing, B., 531
Griggs, W. H., 128
Griot, M. A., 331
Grogan, F. O., 888
Grogan, R. G., 520
de Groote, R., 618
Groven, J., 203
Grümmer, G., 24
Guernsey, F. S., 511
Gümmer, G., 691
Gupta, B. D., 993
Gurlev, A. S., 455
v. Guttenberg, H., 28, 79i, 79n
Gutter, Y., 832p
Guzmán, V. L., 751

Haas, A. R. C., 738, 741, 745, 748, 777
Haasis, F. A., 453, 675
Hack, J., 523
Hagedorn, D. J., 457
Halevy, Z., 668
Hall, G. D., 946
Haller, M. H., 294
Halliday, W. G., 633
Halma, F. F., 736, 743
Hamashima, N., 475
Hamdi, S., 509
Hamilton, C. C., 710
Hamilton, D. W., 344
Hamilton, R. A., 810
Hammarlund, A., 404e
Handa, K. L., 583, 588
Hanger, F., 733
Hansen, E., 190
Hanson, J. B., 21
Hardcastle, A. E., Jr., 404c
Hardenburg, R. E., 487
Harder, R., 691, 692
Harding, P. L., 786
Harding, R. B., 519, 757, 768, 772
Hardy, F., 857, 872
Hare, W. W., 541
Harris, G., 607
Harris, N. L., 167
Harris, R. V., 609
Harris, R. W., 184
Hart, S. A., 638
Hartmann, H. T., 811, 821
Haskew, H. C., 977
Hauge, A., 735j
Hauville, A., 814
Havis, J. R., 399
Havord, G., 864, 865
Haworth, F., 873, 1016s
Hayman, G. R., 550
Hayward, H. E., 153
Haworth, F., 1005
Healey, A. G., 79o
Heiser, C. B., Jr., 537
Hellyer, A. G. L., 1022, 1040, 1061h
Henry, P., 1016t
Henze, R. E., 200
Hernández-Medina, E., 944
Herrmann, —., 513
Heuberger, J. W., 280
van Heusden, W. C., 1016u
Hewetson, F. N., 152
Hewitt, E. J., 47, 434, 466
Hewitt, W. B., 372o
Heymann-Herschberg, L., 767, 773
Hiemeleers, J., 134
Hilbert, G. E., 1055
Hilborn, M. T., 302
Hilkenbäumer, F., 191
Hill, A. C., 412
Hill, R. G., Jr., 389
Hindle, R., Jr., 197
Hirschmann, H., 648
Hitier, H., 402
Hoare, E. R., 1052
Hobbis, E. W., 111, 165, 201h
Hodnett, G. E., 974
Hoffmann, E., 299

Holdeman, Q. L., 309
Holley, W. D., 631, 632
Holliday, P., 878
Holmes, F. O., 567
Homburg, K., 1008, 1009
Honda, N., 241
Hoos, S., 754
Hopfen, H. J., 72
Hopkins, D. P., 1052
Hori, Y., 417
Hoskin, F. C. G., 14
Housley, S., 79d
Ho[uter, P. J.], 70, 75, 177, 214, 493, 500, 503
Houtman, G., 259
Howard, H. W., 491
Howles, R., 424, 646
Hoyt, A. S., 1056
Hudson, J. P., 206
Hughes, J. T., 450, 530
Hulsmann, B., 620
Hunt, O. J., 608
Hunt, P. R. S., 1061a
Hurpin, B., 319
Hyams, E., 1023
Hyde, T. G., 465

Ibbett, W. C., 542o
I.C.T.A., 838, 845, 964, 1024
Imle, E. P., 953
Imperial Chemical Industries Ltd., 79p
Imperial College of Tropical Agriculture, 838, 845, 964, 1024
I.N.E.A.C. (Institut national pour l'Etude agronomique du Congo belge), 834
Institut National de la Recherche Agronomique, 1061i
Institut des Recherches sur le Caoutchouc en Indochine (I.R.C.I.), 949, 957
Institut de Recherches pour les Huiles et Oléagineux, 889, 927, 934, 935
I.R.H.O., 889, 927, 934, 935
Irvine, F. R., 693
Isaakidès, C., 832h
Iwai, S., 664
Iwama, S., 432, 475, 664
Iwata, M., 255
Iyengar, B. N., 905
Izard, C., 402

Jacks, H., 422, 542p
Jackson, P., 371
Jacob, K. C., 1025
Jacobs, K. F., 996
Jacobs, W. P., 33
Jamaica Department of Agriculture, 836
Jancke, O., 342
Jarrett, R. M., 156
Jayadas, C. S., 900
Jefferson, R. N., 626, 672
Jenkins, W. R., 701
Jennings, J. P., 372p
Jenny, J., 263
Jensen, H. J., 683
Jermy, T., 483
(Joachim, A. W. R.), 833
Johansson, E., 118, 149
John, M. E., 438
John Innes Horticultural Institution, 1041
Johnston, A., 1011
Johnston, J. C., 755, 756
Joley, L. E., 243
Jolly, A. L., 860
Jones, E. M., 1061a
Jones, W. W., 832i
de J[ong, L.], 500
de Jong, P., 1016v
Joshi, N. C., 924
Joyner, J. F., 395, 603
Jurin, V. P., 495

Kadam, B. S., 577e
Kaden, O. F., 1016w
Kahl, E., 295
Kahn, R. P., 429
Kailasarao, T., 890
Kaimal, K. N., 1016x
Kandler, O., 542q
Kantor Pusat Statistik, 1016y
Kapoor, L. D., 583, 588
Kapur, N. S., 925
Kapuskasing Dominion Experimental Station, 1042
Karanjan, B. G., 94
van Katwijk, W., 270
Kearns, H. G. H., 292, 362, 372q
Kelley, V. W., 150, 176
Kelley, W. R., 384
Kemmer, E., 3, 201i
Kemmers, W. H., 8
Kemp, I., 57, 419
Kendrick, J. B., 45
Kendrick, J. B., Jr., 519
Kendrick, J. B. S., 520
Kennelly, A. G., 79q
Kenneth, G., 769
Kent, M. J., 79r
Kentville Dominion Experimental Station, Nova Scotia, 1043
Keyes, C. G., 624
Khan, K. F., 592
Khan, M.-u.-D., 783
Kielhauser, G., 155
Kieser, M. E., 213
Killian, C., 1016z
King, N. J., 983
King, T. H., 372z
Kirby, R. S., 542c
Kirchner, J. G., 615i, 832j, 832k
Kirkpatrick, T. W., 874
Kitajima, H., 297
Kitanov, B., 585
Kleczkowski, A., 572
Klein, K. F., 447
Klimenko, K. T., 759
Klimenko, V. N., 759
Klindić, O., 575
Klinkowski, M., 542r
Klos, E. J., 272
Knauth, A., 1034
Knight, A. F., 888
Knight, J. R., 80h
Knoblauch, F., 542s
Knoch, K., 230
Kofranek, A. M., 638, 641
Kogan, L., 1017a
Komarov, I. F., 124
van Koot, I., 64
Košelenko, V. M., 108
Kosugi, K., 663, 713
Kovachich, W. G., 938
Kramer, A., 468, 542t
Krause, W. G. C., 492
Kriegler, P. J., 326
Krishna Marar, M. M., 892
Krishnaswamy, A. R., 592
Kroll, R., 407
Kronenberg, H. G., 211
Krüssmann, G., 105
Kuiper, N. H., 79s
Kulkarni, Y. S., 1013
Kurokami, T., 803

Lachman, W. H., 400, 533
Lagos U., J. A., 542u
Lai, T. M., 975
Lal, K. N., 79t
Lalatta, F., 169
Lamb, R. C., 201j
Land, W. B., 415
Lange, W. H., 372g
Laoh, J. P., 1009
Lara, B. E., 903
LaRue, R. G., 761
Laue, G., 372r
Lawrence, W. J. C., 54
Layne, G. W., Jr., 372y
Leach, A., 625
Learner, E. N., 497
Lee, F. P., 1026
Leggieri, L., 506
Lehr, J. J., 42
Leiby, R. W., 542d
Lejeune, J. B. H., 598
Lekić, M. B., 338
Leoni, I., 918
Leopold, A. C., 511, 645
Lepage, H. S., 735g
Lever, R. J. A. W., 880
Lewis, C. A., 657
Lewis, D., 650
Lewis, G. D., 359
Lhomme, E. J., 1045
Liard, O., 101
Library Branch, Quartermaster Food and Container Institute, Chicago, 201k, 201l, 542v
Lieberman, M., 487
Light, W. I. St. G., 438
Liguori, O., 561
Lin, J. T., 989
Lindgren, D. L., 808
Link, G. K. K., 521
Linser, H., 26
Lisavenko, M. A., 91
Littauer, F., 832l
Little, L. D., Jr., 735m
Liu, P. D., 971, 976
Lloyd, C., 735k
Locke, L. F., 252
Locsin, C., 997
Locsin, C. L., 1017b
Loegering, W. Q., 597
Loewel, E. L., 264
Long, J. K., 801
Longley, R. P., 115, 122, 142
Loos, C. A., 1010
Lord, F. T., 349
Lott, R. V., 137, 180, 201m
Lovatt, B. A., 2
Lovvorn, R. L., 404f
Lucacci, G., 570

Lucas, G. B., 574
Luchini, R., 1
Lugo López, M. A., 973
Lunt, O. R., 630, 638
Lycnos, D., 823
Lyle, E. W., 700
Lyon, A. G., 491

Maatsch, R., 659
McCaughey, W. F., 615g
McColloch, L. P., 514
McCollum, J. P., 534
MacCreary, D., 364, 542e
McFadden, L. A., 647
McGeorge, W. T., 20, 251
McGregor, S. M., 508
McIntosh, D. L., 301
Mack, W. B., 39
Mackay, J. W., 239
Mackinney, G., 783
McKnight, T., 829
McLeod, A. G., 401
Macleod, A. M., 610
MacPhee, A. W., 349
McRae, D. H., 31
Madsen, H. F., 372g
Magie, R. O., 735l
Maillard, J., 319
Maĭsuradze, N. I., 762
Malan, A. H., 234
Malan, E. F., 1017c
Malaya Department of Agriculture, 943
Mallamaire, A., 913
Mameli-Calvino, E., 694
Manaresi, A., 133, 258
Mann, L. K., 443
Manotas A., L. E., 877
Manzoni, L., 244d
Marais, P. G., 79u
Marcus, C. P., Jr., 276
Marinet, J., 615h
Mariño, E. F., 228
van Marle, G. S., 341
Marnette, J., 484
Maron, S. H., 1017d
Marsh, R. W., 292, 372s
Marshall, B. H., Jr., 670
Martin, J. P., 768, 795
Martin, J. T., 368, 371
Martin, W. P., 411
Martino, C., 561
Martyn, E. B., 896
Maschek, F., 26
Maskell, E. J., 868
Massey, D. M., 542w
Mastalerz, J. W., 702
Mathur, P. B., 925
Mathys, G., 346
Matsumoto, H., 844
Matthews, R. E. F., 564
Maurer, K. J., 107
Maveroff, A., 244e
Mayer, A. M., 37
Maymone, B., 832m
Maynard, W. E., 1017a
Maždrakov, P. D., 612
Mazzolani, G., 819
Meahl, R. P., 735m
Meeks, J. W., 615d
van der Meer, F. A., 275
Melis, F., 409
Mendel, K., 778
Mendes, J. E. T., 908, 910
Mendiola-Ela, V., 669
Menon, K. P. V., 891, 1017e
van der Merwe, A. J., 770
Messiaen, C. M., 306
Messing, J. H. L., 735n
Metcalfe, C. R., 44
van der Meulen, A., 201n
Meurman, O., 157, 166
Meyl, A. H., 832n
Michelbacher, A. E., 456
Michigan Agricultural Experiment Station, 1061j
Middlekauff, W. W., 456
Middleton, J. T., 45
Miettinen, J. K., 80d
Miles, P., 466
Mileško, A. J., 93
Miller, E. V., 946
Miller, J. M., 615i, 832j
Miller, M. A., 354
Miller, P. W., 276, 372t
Miller, V. L., 46
Millerd, A., 832o
Millikan, D. F., 271
Milliron, H. E., 542e
Mimault, J., 201t
Minerbi, G., 268
Minister of Agriculture for Canada, 161, 246, 247, 547, 654, 1037
Ministry of Agriculture, London, 6, 352, 372u, 404d, 542x, 542y, 542z, 543a, 615j, 1061k
Minz, G., 793, 832p
Mirić, M., 372v
Misro, B., 653
Mitchell, A. E., 179
Mitchell, J. W., 30
Mitchell, P., 942
Mo, T. T., 540, 898
Moir, K. W., 13
Molotkovskiĭ, G. H., 707
Molotkovskiĭ, Ju. G., 707
Monachino, J., 587
Monnet, J., 848
Mont-Calme, Lausanne, Station Fédérale d'Essais et de Controle de Semences, 1044
Moon, H. H., 372l
Moore, P. W., 740
Moreau, C., 308
Moreau, M., 634, 735o
Moreton, B. D., 438
Morettini, A., 87, 100, 818
Morgan, N. G., 292, 362, 369, 372q
Morris, M. P., 473
Morrison, K. J., 686
Moryganov, A. N., 66
Mosebach, E., 315
(Moser, L.), 225
Mott, R. C., 619
Mueller, R. T., 742
Mühlmann, H., 314
van den Muijzenberg, E. W. B., 79v
Mujica R., F., 471
Müller, R., 288
Mullison, W. R., 378
Müllner, L., 232
Munger, H. M., 441, 442
Mungomery, R. W., 984, 1017f
Munnecke, D. E., 543b
Murakishi, H. H., 690
Murneek, A. E., 175
Murphy, W. S., 768
Murray, D. B., 863, 866, 868
Muzik, T. J., 386
Myers, E. A., 61
Myodo, H., 652

N., E., 9
Nadel-Schiffmann, M., 832l
Naghski, J., 577f
Nagy, B., 372w
Nakasone, H. Y., 667
Napier, C. L., 406
Narain, A., 613
Natividade, J. V., 99
Neary, M. E., 542k
Neff, M. S., 830
Nègre, E., 832q
Negrulj, A. M., 224
Nehring, G., 79n
Nekrasova, T. V., 780
Nelson, K. S., 643
Neri, M., 170
Nettles, V. F., 509
Neumann, G., 416
Newcomer, E. J., 330
Newhall, A. G., 479
Newhall, W. F., 804
Newman, A. S., 34
New Zealand, Director-General of Agriculture, 1047
Nijveldt, W., 540
Nirula, K. K., 1017g
Nisen, A., 728
Nordström, C. G., 661
North, C. P., 744
Norton, D. C., 615k
Novel, P., 88
N.S.W. Department of Agriculture, 327, 340, 699, 735p, 735q, 735r, 776
Nutman, F. J., 884, 885
Nyhlén, Å., 414
Nyholm, I., 717

Oberle, G. D., 132
Odom, R. E., 627
Ogawara, K., 444
Okada, M., 639, 642, 656
Okazaki, M., 241
Okitsu Horticultural Experiment Station, 5
Oku, L., 628
Okumura, M., 652
Oldén, E. J., 261
Olisevič, G. P., 649
van Onsen, J. G., 618
O'Reilly, H. J., 274
Orillo, F. T., 527
O'Rourke, E. N., Jr., 830
Ortega, J. C., 312
Osborn, A., 1027
Otsuka, S., 241
Ovčarov, K. E., 25
Owen, O., 542f

Padfield, C. A. S., 194
Paech, K., 15
Pagan, C., 473
Paisley, K., 735s

Palmiter, D. H., 289
Panattoni, A., 543c
Pao, T. P., 972
Pape, H., 662, 735t
Parker, E. R., 787
Parker, K. G., 272
Parr, W. J., 543d
Parra H., J., 907
Passecker, F., 155
Passino, F., 1028
Patel, M. K., 1013
Patt, Y., 764
Paul, W. R. C., 1015
Paunovič, S., 273
Pearson, C. E., 1029
Pease, R. W., 240
Pelletier, E. N., 302
Pelluchi, L., 543e
Pence, R. J., 365, 832f
Penney, G. L., 397
Peretz, I., 824
Perez S., V. M., 914
Persson, A. R., 433
Petersen, H. I., 404e
Petrosini, G., 539
Philpott, M. W., 962
Pichel, R., 952
Piedrabuena, A. E., 233
van der Pijl, L., 23
Pijls, F. W. G., 79w
Pillsbury, A. F., 59
Pisek, A., 19
Plakidas, A. G., 714
Plasman, A., 287
Plate, H. P., 1061 l
Platonova, E. M., 455
Plaut, M., 321
Plock, H., 125
Pollard, A., 213, 370
Pollard, A. G., 248, 1052
Pope, D. T., 441, 442
Post, J. J., 201o
Potter, J. M. S., 95
Poulos, P. L., 280
Pound, G. S., 565
Powell, A. A., 79x
Powell, D., 293, 303, 372a
Powers, H. R., Jr., 574
Pratt, L. C., 199
Preece, I. A., 610
Preston, A. P., 119
Preston, W. H., Jr., 729
Prince George Dominion Experimental Station, British Columbia, 1048
Proebsting, E. L., 147
Proefstation der C.P.V. te Bogor, 1030
"de Proeftuin" te Boskoop, 617, 696
Prosser, D. S., 800
Protasov, A. F., 66
Protsenko, A. E., 720
Protsenko, E. P., 720
Pulselli, A., 818
Purss, G. S., 852
Purvis, C., 936
Putov, V. S., 112
Py, C., 941

Quackenbush, F. W., 200
Quadt, F., 543f
Quantz, L., 469

Rack, K., 35
Rader, W. E., 488
Ramachandran, K., 1017m
Ramsbottom, J., 1031
Ramsey, G. B., 514
Ráo, J. S., 543g
Rao, K. R. N., 843
Rao, M. B. S., 1017h
Rao, V. T., 843
Raptopoulos, T., 129
Raucourt, M., 372x
de Ravel, G., 428
Ravensberg, K., 393, 730
Read, W. H., 450, 522, 530
Reader, D. E., 579
Regina Dominion Experimental Substation, 1061m
Régnier, R., 319
Reich, H., 318
Reichart, G., 372w
Reid, R. D., 2
Reinders-Gouwentak, C. A., 499
Reisaeter, O., 106
Renac, J., 201t
Renard, —., 735w
Renaud, M., 201p
Renaud, P., 820
van Rensburg, W. J. C., 427
Reuther, W., 769
Revhaug, H., 433
Reyntens, H., 158
Rhoads, W. A., 779
Rhododendron Gesellschaft, Bremen, 728
Ribas, I., 615 l
Ricci, A., 201a, 219
Richards, A. V., 858
Richardson, A. E., 1007
Richardson, B. H., 687
Richardson, J. M., 383
Richardson, P., 86
Rick, C. M., 543h
Ricker, D. W., 752
Rietsema, J., 48
Rimando, V. C., 553
Rings, R. W., 372y
Risdon, E. J., 1017i
Rivals, P., 1017j
Roberts, F. M., 884, 885
Robertson, J. S., 986
Robertson, R. N., 18
Robinson, W. B., 532
de la Rocha G., G., 923
Roche, P., 1017u
Roche, R., 226
Rochecouste, E., 396
Rockland, L. B., 782
Rodrigues, G., 872
Rodrígues Sardiña, J., 568
Rodriguez-Colon, F., 1014
Rogers, B. L., 145
Roistacher, C. N., 666
Rolin, P., 84
Rombouts, J. E., 1017k
Rosselet, F., 763
Rouillard, G., 965
Roulon, 98
Rouquerol, P., 4
le Roux, M. S., 234
Roy, D., 391
Royal Horticultural Society, 676, 681, 726, 1049, 1061n
Royal Institute for the Tropics, Amsterdam, 1050, 1061o
Rubber Research Institute of Ceylon, 948
Rubber Research Institute of Malaya, 947, 955, 956, 958, 960, 961
Rubin, B. A., 138
Rudd, N. G., 380
Ruggieri, G., 792
Rünger, W., 659
Russe, G., 825
Russell, R. S., 1051
Russell, T. A., 862
Russo, F., 832r
Ryall, A. L., 186

Šaĭtan, I. M., 92
Sajnani, B. T., 577e
Sakharam Rao, J., 689
Salisbury, Sir E. J., 688
Salter, P. J., 507
Salter, R. M., 1057
Samish, Z., 784
Santere, D., 825
Santini, R., Jr., 922, 1017 l
Sarlo, M. A., 331
Sasser, J. N., 574
Sastry, A. S., 557
Sastry, S. G., 615
Satina, S., 48
Satyanarayana, M. N., 543i
Sauer, H. F. G., 915
Sayeed, P. M., 893
Sayre, C. B., 532
Scaramuzzi, F., 110
Sch, F., 74
Schaffer, J. J., 979
Scheidecker, D., 1016t
Scheuer, P. J., 844
Schlotzhauer, E. O., 82
Schmidt, G., 611
Schmit, J., 324
Schoenmaeckers, J., 615m
Schomer, H. A., 487
Schroeder, C. A., 746
Schumacher, W., 622
Schvester, D., 322
Schweizerischen Obstverband, 201q
Sciaroni, R. H., 430, 630
Scott, L. E., 542t
Scrivani, P., 526
Seale, C. C., 395, 603
Segall, R. H., 478
de Sugura, C. B., 788
Sekhar, B. C., 1016m
Sell, H. M., 512
Seoane, C., 615 l
Sergeeva, K. D., 204
Serizawa, M., 432
Seshadri, C. R., 893
Seshadri, T. R., 615c
Seychelles Department of Agriculture, 1061p
Shanks, J. B., 729
Shanmukha Rao, N., 1017m
Sharma, M. R. G., 615
Sharma, S. L., 981
Sharp, D. G., 563
Sharp, S. S., 377
Sharpe, R. H., 256
Sharvelle, E. G., 360
Shaw, F. R., 16
Shaw, W. C., 404f
Shay, J. R., 285, 359

Shear, C. B., 831
Sheard, E., 522
Sheets, O., 410
Sherbakoff, C. D., 791
Shetty, H. M., 1017n
Shukla, T. C., 462
Shurtleff, M. C., 735u
Shutak, V. G., 197, 198, 199
Siddappa, G. S., 79y
Siegelman, H. W., 269
Sierra Leone Department of Agriculture, 1061q
Siev, D., 504, 668
Silberger, J., Jr., 36
Simmonds, F. J., 992
Simmonds, N. W., 847
Simons, R. K., 154
Sims, A. J., 366
Singh, K. K., 925
Singh, R. N., 1017o
Sitton, G. R., 822
Sivadjian, J., 79z, 80a
Skiles, R. L., 372z
Skolko, A. J., 421
Skoog, F., 36
Smith, C. B., 39
Smith, F. F., 518, 701, 719, 735 l
Smith, H. C., 284
Smith, P. F., 769, 774
Smith, P. G., 537
Smith, R. J., 450, 530
Smith, W. L., Jr., 294
Snijders, J. H., 22
Society of Chemical Industry, 248, 1052
Soenen, A., 335
Sogabe, T., 803
Sokolova, V. E., 138
Sørensen, H., 80b
Southern Rhodesia Tobacco Research Board, 552
Southwick, F. W., 181, 533
Soyer, L., 835
Spagnoli, A., 201r
Specht, A. W., 774
Spencer, J. E., 595
Speyer, E. R., 543d
Speyer, W., 472
Spina, P., 812, 816, 832s
Spray, J. R., 403
Spreafico, L., 404a
Spreng, H., 168
Spyros Paraschis, M., 616
Srinivasan, M., 543i
Srivastava, S. N. S., 735v
Staehelin, M., 139
Stahl, C., 1061g
Stamper, E. R., 398
Stant, M. Y., 602
Stanton, W. R., 286
Steffen, L., 735w
Stein, G., 416
Steinberg, R. A., 577c
Steindl, D. R. L., 983
Stellwaag, F., 278, 337
Stenmark, A., 325
Stevens, W. L., 1017p
Stevenson, E. C., 496
Stevenson, I. L., 159
Stevenson, J. A., 912
Stinson, R. F., 624
Stolp, H., 38
Storey, I. F., 436
Storey, W. B., 810
Storrs Agricultural Experiment Station, Connecticut, 1061e
Stover, R. H., 851, 1017q, 1017r
Strajin-Tomić, B., 265
Stratton, C. L., 353
Strauss, E., 209
Street, H. E., 80c, 508
Struys, L. C., 50
Stuart, N. W., 674, 678, 679
Sturdy, M., 218, 408
van Stuyvenberg, J. H., 85
Subba Rao, M. S., 79t
Sugiyama, T., 255, 417
Summerland, S. A., 344
Sun, V. G., 971, 976, 1017s
Sundaram, S., 920
Susini, E., 735x
Süssbrich, H., 446
Svjatelik, N. A., 593
Swain, T., 661
Swirski, E., 794

Tabayoyong, F. T., 1017b
Taiwan Sugar Experiment Station, Plant Breeding Department, 968
Talbert, T. J., 1032
Tamir, P., 171
Tanada, A. F., 844
Tapley, R. G., 917
Tapley, W. T., 505
Tarasenko, M. P., 113
Tarr, S. A. J., 1033
Taschenberg, E. F., 328
Tatchell, A. R., 607
Tatebe, T., 543j
Taylor, G. S., 411, 573
Tea Research Institute of Ceylon, 998
Teich, Y., 824
Tendolkar, G. S., 1017t
Ten Houten, J. G., 43
Termohlen, G. P., 201s
Terra, G. J. A., 840
Teubner, F. G., 175, 189
Teuscher, H., 704
Thakoor, N. R., 1017t
Thiele, K. P., 620, 1034
Thomas, L. A., 114
Thomas, P. K., 892
Thomas, W., 39
Thomas, W. D. E., 366
Thompson, A. H., 145
Thomson, R., 401
Thornton, N. C., 1017r
Thresh, R., 27
Timberlake, C. F., 213, 370
Tinsley, T. W., 437
Titus, J. S., 143, 146
Tjaželjnikov, A. D., 90
Tobacco Research Board of Southern Rhodesia, 552
Togliani, F., 373a, 373b, 373c
du Toit, J. L., 963
Tolhurst, J., 148, 156
Tombesi, L., 17
Tomova, M., 584
Toovey, F. W., 926, 933
Torrey, J. G., 32
Toth, S. J., 412
Tresch, —., 460
Trickett, R. S., 693
Trinidad and Tobago Director of Agriculture, 839
Trivelli, G., 367
Troxel, A. W., 519
Troxler, R. V., 517
Tsai, T. K., 988, 990
Tuft, T. O., 529
Tukey, H. B., 697
Tukey, R. B., 183
Tumanov, I. I., 766
Tunblad, B., 262, 325
Turrill, W. B., 677
Twyman, R. C., 542o

Ubrizzy, G., 372w
Ulevitch, I. N., 1017d
Ulrich, R., 201t
Underwood, J. C., 782
Unger, K., 502
United Planters Association of Southern India (U.P.A.S.I.) 999, 1002, 1012
Unruh, M., 249
Uota, M., 187, 188
Urhan, M., 906
U.S. Department of Agriculture, 1035, 1053, 1054
U.S. Department of Agriculture Tobacco Branch, 548

Vallecilla, C. A., 870
Varadhan, C., 615n
Varier, N. S., 900
Varma, P. M., 578, 615f
Vasseur, R., 322, 345, 347
Vega, J., 233
Veiga, A. A., 96
Velly, J., 1017u
Venkatachalam, V., 920
Verghese, E. J., 892
Vervloet, C., 1017v
Victor, B., 76
Victoria Department of Agriculture, 81
Vidal, J.-P., 226
Viel, G., 372x
Viennot-Bourgin, G., 543k
Vieregg, A., 542q
Villanova M., T., 919
Vincent, L. E., 808
Vinogradov, P. I., 501
Virtanen, A. I., 80d
Vitagliano, M., 556
Vittum, M. T., 505
de Vogel, P., 724
Volcani, R., 832t
Vos, H. C. C. A. A., 440
Vriend, S., 448
de Vries, J. T., 723
Vrijhof, B., 173

Waddell, C. W., 980
Wade, G. C., 290
Wadleigh, C. H., 153
Wageningen, Instituut voor Tuinbouwtechniek, 373d, 1058
Wainstein, P., 590
Waite, B. H., 850
Waldo, G. F., 208
Wallace, A., 708, 742, 744, 771
Wallace, J. M., 832u
Wallace, T., 80e
Wallen, V. R., 421

Wallihan, E. F., 775
Walter, T. E., 1004
Wang, S. C., 975
Ward, J. R., 290
Wardlaw, C. W., 543l
Waring, E. J., 435
Warne, L. G. G., 485
Wasowicz, T. E., 865
Watanabe, H., 463
Watanabe, I., 444
Waterston, J. M., 937
Watson, D. P., 633, 644, 673
Watson, R., 132
Watts, A. T. J., 131
Waygood, W. A., 591
Weathers, L. G., 565
Weaver, L. O., 283
Weaver, R. J., 236
Webster, G. R., 55, 62
Wedding, R. T., 779
Weiss, L. C., 921
Weissenborn, K., 144
Welecska, —., 71
Wells, D. A., 58
Wells, J. S., 705, 711, 718, 731, 734
Wender, S. H., 201w
Wenzl, H., 295
West African Cacao Research Institute (W.A.C.R.I.), 854, 855, 856
West African Institute for Oil Palm Research, 1060
Westgarth, D. R., 950, 962
de Wet, A. F., 117
Whitaker, T. W., 542b
White, D. G., 182
White, E. V., 1017w
White, P. R., 80f
Whitehouse, W. E., 243
Whiting, F. L., 757
Whitsell, R., 749
Wiant, J. S., 514
Wichers, A. J., 80g, 193, 201u, 543m
Wickremasuriya, C. A., 895
Widdows, J. O., 1003
Widdowson, F. V., 413
Widmer, R. E., 722
Wiebe, J., 405
Wiedow, H.-L., 28
Wiersum, L. K., 1017x
Wijeratne, W. M., 549
Wilcox, J. B., 80h
Williams, A. E., 53
Williams, A. H., 201v
Williams, B. L., 201w
Williams, E. B., 285
Williams, G., 879
Williams, K. T., 80i
Williams, P. H., 452, 522, 523, 528
Williams, R. O., 886
Williams, R. R., 130
Williamson, E. C., 636
Williamson, J., 735y
Willits, C. O., 577f
Willmott, P. K., 86
Wilson, J. D., 543n
Wilson, R. A., 357, 372l
Winkler, E., 19
Winslow, M. M., 832v, 832w
Winter, E. J., 58
Winters, H. F., 1014
Wise, K. J., 543o
Wisconsin Agricultural Experiment Station, 1059, 1061r
Wishnetsky, T., 532
Withrow, A. P., 80j
Withrow, R. B., 80j
de Witt, K. W., 869, 881
Witte, K., 68
Wittwer, M., 497
Wolf, W. D., 563
Woodford, E. K., 376
Wooding, N. H., Jr., 61
Woolman, J., 1036
Woudenberg, J. P. M., 730
Wright, S. J., 1006
Wurgler, W., 139, 387

Yakiwa, T., 476
Yamada, T., 656
Yamaguchi, M., 543p
Yang, C. C., 975
Yang, T. C., 966
Yashiro, H., 255
Yates, R. E., 244b
Yeates, J. S., 712, 732
Young, H. E., 951
Young, H. Y., 381

Zaheer, S. H., 1017m
Zanzibar Department of Agriculture, 883
Zaumeyer, W. J., 470
Zdruĭkovskaja, A. I., 109
de Zeeuw, A., 64, 423
de Zeeuw, D., 80k
Zentmyer, G. A., 750, 832x, 832y
Zillig, H., 220
Zobrist, L., 299
Zucchini, M., 201x
Žukov, N. I., 577g
Žuljević, I., 265

# INDEX

## H.A. Vol. 24. No. 2.

N.B.—Brackets round the name denote that this person, although not the author, was directly or indirectly concerned with the article.

(Abbiss, H. W.), 2104
Åberg, B., 1102
Abraham, E. V., 2019
Abrahamse, S., 1183
Abramov, N. A., 1194
Abson, J. W., 1732
Adamson, N. J., 1697a
Aerts, R., 1338
Aggarwal, J. S., 1742j
Ahlberg, O., 1544
Aitkenhead, P., 1296
Akesson, N. B., 1485a
Akhurst, C. G., 2021
Aksu, S., 1692
Aladžajkov, L., 1492
Albrecht, D., 1307
Aldrich, R. J., 1485g
Aleksandrov, A. D., 1849
Alekseenko, R. D., 1155
Alekseeva, M. V., 1593
Algérie, Gouvernement Général, 2096
Allan, H. R., 1346
Allen, E. F., 1937
Allen, H. T., 1813a
Allen, N., 1686
Allen, S. E., 1573
Allerton, F. W., 1589, 1624
Alscher, R. P., 1647a
Althuisius, F., 2006
Alvarez García, L. A., 1683
Alvim, P. de T., 1985
do Amaral, S. F., 1999
Ames, O., 2080
Anand, J. C., 2001
Anderson, L. D., 1523
Andison, H., 1381
Andrade, A. C., 1862
Andrén, F., 1339
Anet, E. F. L. J., 1215
Anicié-Bosnjak, Z., 1295k
Anjaneyulu Naidu, N., 1844
Anon., 1068, 1081, 1126, 1138, 1139, 1142, 1145a, 1145b, 1174, 1217, 1249, 1299, 1428, 1429, 1453, 1455, 1462, 1469, 1485b, 1491, 1493, 1548, 1638, 1647b, 1654, 1655, 1713, 1720, 1722, 1728, 1770, 1775, 1786, 1815, 1827, 1836, 1912a, 1926, 1934, 1940, 1977, 2026, 2042, 2062, 2074, 2078a, 2078b
Anstett, A., 1282
Antonjuk, A., 1496
Antunes Filho, H., 1990
Aramayo, H. S., 1824
Araneta Institute of Agriculture, Philippines, 2114
Arceneaux, G., 2063
Arisumi, T., 1168
Armand, J. E., 1645
Armitage, H. M., 1398
Arnold, C. Y., 1629
Arnon, D. I., 1120
Arruda, S. C., 2058
Arsoy, I., 1295a
Artozoul, J., 1261
Arzee, T., 1912b
Asen, S., 1788
Ashizawa, M., 1201, 1480
Aspinall, G. O., 1742a
Atchison, E., 1145i
Atkinson, F. E., 1236a
Atkinson, R. G., 1608
Audus, L. J., 1576
Australia, Commonwealth Dried Fruits Control Board, 1295b
Australia Department of Health, 1414
Australian Canned Fruits Board, 2119a

B., G., 2057
Bachmann, F., 1430, 1432, 1434
Bagot, Y., 1910
Baker, C. E., 1230
Baker, K. F., 1754
Baker, R. E. D., 1939, 1941, 1961, 2078c
(Baldacci, E.), 1642
Baldin, P. G., 1622
Baldini, E., 1895
Banfi, A., 1828, 1912c
Banga, O., 1647c
Bañoch, Z., 1742e
Baranek, P. P., 1485c
Baranova, A. P., 1195
Baranovskiĭ, A. L., 1272
Baratte, J., 1603
Barkley, F. A., 1412
Barltrop, J. A., 1711
Barnard, G. K., 1134
Barnes, A. C., 2078d
Barr, W. L., 1129
Barret, W. H. G., 1813b
Bártfay, T., 1571
Bartlett, B. R., 1876
Basanjko, A. A., 1279
Basu, G., 2003
Bates, G. R., 1678
Battaglini, A., 1912k
Baudel, J., 1261
van Bavel, C. H. M., 1669
Bazzigher, G., 1364
Beaufils, E. R., 2029
Beaumont, A., 1813c
Beaumont, J. H., 1984
Beckenbach, J. R., 1647r
Becker, E. M., 1460
Becker, T., 1145c
Begg, J. A., 1688
de Bellefroid, V., 1963
Beñatena, H. N., 1828, 1912c
Benincasa, M., 1656
Bennett, R. R., 1445
Bental, A., 1859
Berbeć, J., 1682
Berger, S., 1591, 1632
Bernal E., G., 1991
Berrill, F. W., 1920
Bester, J. J. A., 1224
Bharucha, F. R., 1088
Bhat, J. V., 1707
Bhati, A., 2078e, 2078f
Bhatia, I. S., 1721
Bhattacharyya, S. C., 2078f
Bheemeswar, B., 1742b
Białobok, S., 1799
Bicudo, L. P., 2078g
Biddulph, O., 1117
Bidwell, R. G. S., 1145d
Bielka, R., 1487
Bigornia, A. E., 1974
Biologische Zentralanstalt für Land- u. Forstwirtschaft in Berlin-Dahlem, 2081
Bishop, C. J., 1813d
Bitancourt, A. A., 1863
Bitters, W. P., 1855
Black, J. N., 1144
Blackith, R. E., 1516
Blacklock, J. S., 1704
Blackman, G. E., 1144
Blaha, J., 1321
Blake, G. R., 1647h
Bleasdale, J. K. A., 1084
Blumer, S., 1514
Blunck, H., 1687, 2082
Blundell, E., 2064
Bocchi, A., 1112
Bode, O., 1679
Bohn, G. W., 1613
Böhnert, E., 1769
Bokučava, M. A., 2073
Boll, W. G., 1647d
Bollard, E. G., 1207
Bolle-Jones, E. W., 2078h
Bolli, M., 1693
Bollow, H., 1766
Bolsunov, I., 1664, 1674
Bolsunov, T., 1697b
Bömeke, H., 1199, 1435a
Bond, J. A. B., 1997
Bonde, E. K., 1104
Bonnemaison, L., 1605
Borden, A. D., 1435j
Borden, R. J., 2036

Borihina, M. G., 1733
Börner, C., 1435b
van den Bosch, R., 1912d
Bose, A. N., 2003
Boselli, F., 1385
Bösenberg, K., 1402
Botley Fruit Station, 1244
Bouat, A., 1900
Bouché-Thomas, E., 2083
Bould, C., 1435c
Bousard, M., 1560
Bousser, R., 1235
Bowen, J. F., 1236b
Branas, J., 1357
Braun, A. C., 1697c
Bravenboer, L., 1554
Bremer, A. H., 1623
Brewer, D., 1577
Briggs, D. R., 1811
Briggs, L. H., 1742c
Brindley, T. A., 1581
British Council, 1069
Broadbent, L., 1539
Broatch, J. D., 1932
Brock, R. D., 1773
Broker, R., 1707
Brooke, D. L., 1489
Brooks, R. M., 1159
Brossier, J., 1566
Brown, B. A., 1503
Brown, E. B., 1376
Brown, F. B., 2013
Brown, W. H., 1449
de Bruin-Brink, G., 1697d
Brusca, J. A., 1855
Bryn Adda Horticulture Demonstration Station, 1062
(Buchholtz, K. P.), 1461
Budaga Rao, J., 1739
Bulanda, M., 1196
Burg, J. P. L. L. A., 1706
Burger, I. J., 1647g
Burgesser, F. W., 1473
Burgis, D. S., 1648b
Businger, J. A., 1133
Busschots, A., 1344
Buzacott, J. H., 2078i
Byerrum, R. U., 1103
Byrde, R. J. W., 1417

Calvert, J., 1672
Calvino, G. E. M., 1745
Camargo Mendes, H., 1989
Cameron, A. E., 1835
Cameroons Development Corporation, 2119b
Campos, J. D., 2078j
Cantelo, W. W., 1803
Carilli, A., 1456
Carlson, R. F., 1481
Carolus, R. L., 1481
Carr, D. J., 1145w
Carra, —., 1751
Carrante, V., 1271
Carré, J., 1982
Casarini, B., 1535
Castaño A., J. J., 1991
Castberg, C., 1220
Catel, W., 1213
Cercós, A. P., 1413
Černjaev, I. P., 1189
Černyš, A. I., 1140
Cerrini, U., 1236c
Chakravarti, D., 1742d
Chakravarti, R. N., 1742d
Chakravarti, S. C., 1742d
Chakravarty, M. M., 1911
Chamblee, D. S., 1780
Champion, J., 2078k
Chapot, H., 1857
Charles, A., 1710
Charter, C. F., 1932
Chase, J. L. H., 1647e
Chaudhuri, R. H. N., 1712
Chavancy, A., 1725, 1909, 1916
Cheal, W. F., 1244, 1245, 1246
Chester, K. S., 1123
Chevassus, A., 1567
Chibnall, A. C., 1574, 1575
Childs, J. F. L., 1912e
Chisholm, M. J., 1290, 1295c
Chládek, M., 1742e
Chollet, P., 1162
Chopinet, R., 1565
Chopra, R. N., 1647f
Choudhari, B. L., 2011
Choudhri, B. L., 2078l
Choudhury, D. K., 1911
(Christ, E. G.), 1309
Christensen, B. E., 1145v
Christensen, E., 1094, 1095
Churchward, J. G., 2069
Cibes, H. R., 1802
Ciccarone, A., 1360, 1633
Ciferri, R., 1310, 1596, 1902
Čirikov, Ju. F., 1626
Čirkovskiĭ, V. I., 1658
Clark, F., 1659
Clark, R. E., 1435j
Clausen, R.-L., 1435d
Clayton, C. N., 1435p
Cleppa Park Horticulture Demonstration Station, 1063
Clopton, J. R., 1741
Cochran, L. C., 1329
The Cocoa, Chocolate and Confectionery Alliance, ltd., 1932
Coetzee, W. H. K., 1647g
Cohen, M., 1856
Colbran, R. C., 1368
Colhoun, J., 1541
Collins, J. C., 1652
Collyer, E., 1435e
Colmer, A. R., 1477
Colombo, C., 1810
Commoner, B., 1697e
Commonwealth Dried Fruits Control Board, Australia, 1295b
Commonwealth Economic Committee, 1146, 1914
Congdon, N. B., 1420
Connors, C. H., 1793
Constable, D. H., 1918
Cooil, B. J., 1923
Cook, J., 2028
Cook, J. B., 1881
Cooke, N. E., 1216
Coolhaas, C., 1913
Coombe, B. G., 1284
Cooper, D. R., 1698
Cope, F. W., 1939, 1941, 1946, 2078m
Copley, T. L., 1665
(Corbett, G.), 1653
Corbett, R. E., 1742f
Corey, A. T., 1647h
(Corradini, V.), 1642
Correll, D. S., 1742g, 2080
Cortvriendt, S. F., 1805
Cosmo, I., 1256, 1257
Cottier, E. F., 1485d
Couillaud, P., 1305, 1359
Cradock, F., 1508
Crafts, A. S., 1440
Crawford, D. E., 1649
Cree, C. B., 1912h
Crellana, R. G., 1958
Cressman, A. W., 1398
Crnko, J., 1727
Crouse, R. H., 1697f
Croxall, H. E., 1539
da Cruz, H. M., 1957
Cruzado, H. J., 1447, 1459
Cuccia, C., 1258, 1267
Culaja, V. I., 1821
Cumber, R. A., 1723
Curtis, J. D., 1801
Cyprus Agricultural Research Officer, 2098
Cyprus Tobacco Officer, 1653

Dale, W. T., 1939
Danon, M., 1611
Darley, E. F., 1082, 1083, 1085
Darrow, G. M., 1250
Darrow, R. A., 1485e
Das, B. M., 1740
Daudin, J., 1929
Davidson, L. G., 2063
Davis, C. W., 1236b
Davis, J. R., 1128
Davis, L. H., 1754
Decastro, V., 2000
Deĭmontivič, B. I., 1670
Delmas, E., 1121
Dementjeva, M. I., 1351
Dermott, W., 1236d
Desgraz, A., 1150
Desrosier, N. W., 1646
Deutsche Akademie der Landwirtschaftswissenschaften, 2117
Deutschmann, F., 1354
Devjatov, A. S., 1175
DeWolfe, T. A., 1864
Dg, 1647i
Dick, J., 2060
Dickey, R. D., 1795
Dieter, C. E., 1519
Dijksterhuis, H. P., 1341
Dimond, A. E., 1639, 1640
van Dinther, J. B. M., 1584
Ditman, L. P., 1582
Doepel, R. F., 1637
Domato, J., 1824, 1832
Dominick, B. A., Jr., 1232
Doorenbos, J., 1090
Dore, J., 1091
Dormer, K. J., 1568
Dovgopolyĭ, G., 1498
Drake, R. J., 1816
Drake, R. M., 1465
Drouzy, J., 1565
D.S.I.R., New Zealand, 2099
DuCharme, E. P., 1865
Dukeshire, N. W., 1855
Dulac, J., 1900
Dumas, —., 1425

Dun, G. S., 1976
Dunbar, C. O., 1165
Dupaigne, P., 2014
Duperrex, A., 1813e
Durbin, R. D., 1435f
Duruz, W. P., 1992
Duthie, D. W., 1917
Duynhouwer, D. J., 1913
Dwyer, R. E. P., 1973

Ealy, R. P., 1747
Eaves, C. A., 1210
Echeverri, H., 2027
Eddins, A. H., 1536
Eden, D. R. A., 1932
Eden, T., 1917, 2072
Edwards, B. A. B., 1875
Eggman, L., 1145e
van Eimern, J., 1315
Elandt, R., 1145f
Elgin, N., 1697g
Ellis, D. E., 1647j
Emiliani, G., 1360
Engelbrecht, D. J., 1335
English, A. R., 1114
English, H., 1355
English, W. S., 1400
Ennis, W. B., Jr., 1451
Entomological Branch, N.S.W. Department of Agriculture, 1387, 1411, 1644, 1647w
Enzor, J. K., Jr., 1839
Erakman, K., 1663
Erasmus, J. C., 1742h
Ergesjan, R. A., 1270
Erygina, N. P., 1281
Eschrich, W., 1813f
van Essen, W. J., 2034
Ethirajam, A. S., 2078n
European Plant Protection Organization, 1080
Evans, G., 2025
Evans, H., 1951
Evans, W. D., 1320
Evenari, M., 1614, 1615
Evreinoff, V.-A., 1236e, 1288
Ewart, M. H., 1811

Faivre, M., 1312
Fajardo, P. S., 1531
Falch, J., 1200
Falk, K., 1647k, 1647l
Farmer, A., 1182
Fedorinčik, N. S., 1861
Felius, P. M., 1090
Fennah, R. G., 1950
Ferguson, J., 1758
Fici, P., 1259
Fidel Castro, M., 2078o
de Figueiredo, E. R., Jr., 1818
Fischer, R., 1348
Fischer, D. V., 1222
Fisher, F. J. F., 1137
Fjäderhane, A. M., 1746
Fleming, H. K., 1248
Florenchie, —., 1751
Flores A., M. A., 2054
Florida Agricultural Experiment Stations, 2101
Folckemer, F. B., 1435g
Follwell, J. H., 1375
Food and Agriculture Organization of the United Nations, 1073, 1074, 1075, 2100
Ford, E., 2078p
Forrest, L. A., 1665
Forsyth, W. G. C., 1966
Fort William District Experiment Substation, 2102
Fosen, E. H., 1398
Foster, Z. C., 2077
Fourmont, R., 1566
Fox, C. J. S., 1697h
Francesconi, F., 1896
Franco-Bétancourt, J. J., 2078q
Franco, C. M., 1989
Frankenburg, W. G., 1691
Fraselle, J. V., 1995
Fraser, I. M., 1590
Freed. S., 1145s
Friedrich, G., 1236f
Friend, J. N., 1513
Friesdorf Horticultural Research Station, 1744
Frost, K. R., 1130
Fulling, E. H., 1716

(Gabelman, W. H.), 1601
Galbraith, W. S., 1588
Gallay, R., 1255
Gammon, N., Jr., 1291, 1800
Gangstad, E. O., 1726
(Gardner, V. R.), 1309
Garland, H. L., 2040
Garner, R. J., 1177
Garrard, A., 1576
Garren, R., Jr., 1756
Garriss, H. R., 1697i
Garthwaite, J. M., 1537, 1743
Gassner, G., 1774
Gauthier, A., 1071
Gayford, G. W., 1149
Geelen, T. E. J. M., 1350
Geier, P., 1391
Geissler, T., 1501
George, E. J., 1324
Geraldson, C. M., 1546, 1634
Gerasimova-Navašina, E. N., 1742o
(Gerhardt, F.), 1227
Gerritsen, J. D., 1163
Gerstel, D. U., 1742i
Gertych, Z., 1198
Gibberd, A. V., 1932, 2084
Gibberd, V. L., 2084
Gigante, R., 1317
Gilmour, J. S. L., 1145g, 1145h
van Gils, G. E., 2030
Ginsburg, L., 2017
Giordano, B., 1262
Godchaux, L., 1485f
Goguadze, M. N., 1390
Gold Coast Department of Agriculture, 2103
González, C. A., 1988
Goodman, R. N., 1333
Gorbatov, P. P., 1141
Gorlenko, M. V., 1298
Graham, S. O., 1172
Grandori, R., 1522
Granhall, I., 1154
Graniti, A., 1332
Gray, H. E., 1517
Greene, R. E. L., 1489
Greenleaf, W. H., 1635
Greenway, P. J., 2007
Grekowicz, M., 1591
Greulach, V. A., 1145i, 1145j
Griemsmann, —., 1397
Griffiths, A., Jr., 1795, 1800
Griffiths, J. T., 1839, 1872
Grigsby, B. H., 1481
Grill, F., 1295d
de Groote, R., 1805
Grossenbacher, F., 1499
Guernsey, F. S., 1630
Guha, P. C., 2078f
Guillé, J., 1928
Guillermo, R. J., 2046
Guinard, A., 1916, 1981, 2066, 2067
Gulval Experimental Station, 2104
Gunckel, J. E., 1096
Gunn, J. S., 1917
Gunn, J. T., 1883
Gunther, F. A., 1878
Gupta, S. C., 1742j
Gurdián Morales, M., 2078r
Guseva, A. R., 1733
Gutter, Y., 1888
Guyot, H., 1924
Gwynne, D. C., 1539

Haak, A. H., 1913
de Haan-Homans, L. N. S., 2031
Haasis, F. A., 1771
Hačatrjan, S. S., 1273
Hackett, D. P., 1145k
Hahn, P., 1529
Halabuda, L. P., 1155
Hale, S. L., 1933
Hall, E. G., 1223, 1225, 1226, 1231
Hall, N. S., 1667
Hall, W. C., 1628
Halma, F. F., 1817
Hamilton, R. A., 2009
Hamilton, R. H., 1485g
Hammond, B. L., 1742i
Hammond, D. H., 1178
Hammond, P. S., 1932
Hamner, C. L., 1788
Hanger, F. E. W., 1794
Hanger, W. G., 1742f
Hannay, J. W., 1116
Hansen, E., 1145v
Harcourt, D. G., 1552
Hard, M. M., 1431
Hardcastle, W. S., 1476
Harding, P. L., 1847
Harding, R. B., 1837
Hardy, F., 1939
Haritonova, E. N., 1157
Harris, J., 1780
Harris, R. J., 1945
Harrison, H. C., 1507
Hartmair, V., 1488
Hartzell, A., 1750
Haskell, G., 1197, 1621
Hatipov, A. E., 1167
Hatipov, S. E., 1167
Hattingen, R., 1808
(Havis, A. L.), 1206
Havord, G., 1939, 1948
Hawaiian Sugar Planters' Association, 2035, 2048, 2049, 2051

Hawks, S. N., Jr., 1445
Hayashi, K., 1530
Hayslip, N. C., 1648h
Hebert, L. P., 1474
Heimann, H., 1906
Hellmers, E., 1760
Henbest, H. B., 1108
Henderson, D. M., 1597
Hendrickson, R., 1889
Hendrix, J. W., 1325
Henze, R. E., 1229, 1230
Herbert, F. B., 1454
Heredia Luna, S., 1832
Herfs, A., 1379
Herklots, G. A. C., 1813g
Hertgers, J., 1435h
Herzfeld, E. W., 1912f
Hey, G. H. L., 1607
Hill, G. D., 1484
Hill, R. G., Jr., 1295e
Hill-Lewis, C., 2078s
Hillman, H. D., 1647m
Hilton, R. J., 1203
Hinrichs, H. A., 1160
Hinz, W. W., 1130
Hirt, W., 1314
Hoffman, A., 1297
Hoffman, I. C., 1647n
Hoffmann, O. L., 1111
Holttum, R. E., 2085
Holtzmann, O. V., 1813h
Homburg, K., 2071
Homero Bassi, R., 1647o
Homès, M. U., 1947
Honda, N., 1287
Hong Kong Department of Agriculture, Fisheries and Forestry, 2115, 2119d
Hope, A. B., 1115
Hopkins, C. Y., 1290, 1295c
Hopkins, D. P., 1145l
Hopkins, H. T., 1125
Horner, C. E., 1719
Horticultural Education Association, 2105, 2119e
Howard, G. A., 1731
Howell, W., 1779, 1782
Hudson, J. P., 1240, 1241
Hudson, W. J., 1508
Huet, R., 2016
Huffman, J. W., 1372
Hugo, J. F. du T., 1647g
Humphrey, E. V., 2078t
Hungerford, T. A. G., 2078u
Hurtado Belgado, M. A. J., 1647o
Hutchins, L. M., 1331
Hutchinson, A., 1180
Hutson, R., 1388, 1600

Igaravídez, L., 2076
Ignatius, J. G. W., 1148
Illinois Agricultural Experiment Station, 2106
Imperial College of Tropical Agriculture, 1939
Indian Tea Association, Tocklai, 2068
I.N.E.A.C. (Institut National pour l'Étude Agronomique du Congo belge), 2086
Ingebrigtsen, S., 1610
Ingram, J., 1147
Inoue, T., 1897
Institutt for Blomstedyrking og Veksthusforsøk, 1806
Isaac, I., 1647p, 1647q
Issa, E., 1912g, 1925
Ivanov, S. M., 1813i
Ivens, G. W., 1482

Jack, A., 1648b
Jacks, H., 1300
Jacob, F. C., 1883
Jacombs, F. E., 1742c
Jakuškina, N. I., 1627
Jamalainen, E. A., 1221
James, D. P., 1236g
Jamison, F. S., 1506
Janes, B. E., 1505, 1506
Janke, A., 1418
Jankiewicz, L., 1799
Jaramillo Arango, R., 2078v
Jeansonne, R. J., 2044
Jeffers, R. H., 1236h
Jeffery, M. W., 1340
Jeffreys, J. A. D., 1711
Jenkins, A. E., 1863
Jenkins, C. F. H., 1875
Jenkins, J. M., Jr., 1771
Jensen, D. D., 1330
Jeppson, L. R., 1878
Jex, W. F. C., 2039
Johansson, E., 1405
Johar, D. S., 2001
Johnson, E., 1444
Johnson, S. P., 1628
(Jones, D. K.), 2098
Jones, E. R. H., 1108
Jones, G. D., 1647z
Jones, L. S., 1329
Jones, P. A., 1979
Jones, W. W., 1912h
Joubert, F. J., 1698
Joyner, J. F., 1726
Jungwirth, E., 1825

Kaden, O. F., 2078w
Kaljtja, A. Ja., 1595
Kanabe, T., 1480
Kaniuga, Z., 1587
Kapur, N. S., 2002
Karmakar, G., 1089
Karnatz, H., 1202, 1308
Karner, P., 1742k
Karpenko, E. R., 1626
Katulska, C., 1169, 1187
van Katwijk, W., 1326, 1327, 1807
Keane, F. W. L., 1164
Kebby, R. G., 2008
Kebrle, J., 1742k
Keen, Sir B., 1917
Keller, K. R., 1729
Kelman, A., 1512
Kelsall, A., 1210
Kelsheimer, E. G., 1647r, 1783
Kempf, N. W., 1965
Kendrick, J. B., Jr., 1082, 1083, 1085
Kenya Department of Agriculture, 2119f
Kessler, H., 1219
Kesterson, J. W., 1889
van Keulen, W., 1135
Keyer, E. J., 1341
Kidd, C., 1742i
Kidder, E. H., 1128
Kieser, M. E., 1236i
Kincaid, R. R., 1661, 1689
King, N. C., 2055
Kirchner, H.-A., 1599
Kirillov, F. F., 1318, 1319
Kirkpatrick, T. W., 1964
Kisljakov, V. D., 1814
Klang, C. A., 1405
Klatt, W. L., 1443
Kleczkowski, A., 1697j
Klimenko, K. T., 1829, 1843
Klimenko, V. N., 1829
Klingman, G. C., 1484
Klinkenberg, C. H., 1369
Klinkowski, M., 2087
Kloft, W., 1380
Klotz, L. J., 1864, 1912i
Knapp, R., 1145m
van der Knaap, W. P., 1943, 1944
Knight, R., 1932
(Knights, J. K.), 2102
de Knop, O., 1995
Knorr, L. C., 1854, 1856, 1863
Koblic, J., 1551
Kodenko, A. N., 1281
Kodera, M., 1556
Köhler, E., 2087
Kolesnik, Z. V., 1275
Koltermann, A., 1679
Kondô, H., 1530
Konstantinov, N. N., 1705
Koroljkov, E. D., 1497
Korte, W., 1647s
Kosilkin, I. A., 1850
Kott, V., 1214
Kouyeas, V., 1367
Kramer, A., 1582
Kraus, E. J., 1756
Kraus, H., 1418
Krause, W. G. C., 1647t
Kravcova, B. E., 1627
Kreĭcberg, V. E., 1145n
Kreutz, W., 2088
Krishna Murthy, D. V., 1742l
Kristensen, H. R., 1647u
Krivolapov, G., 1498
Kroll, U., 1917
Krotkov, G., 1145d
Krug, C. A., 2078x
Krüssmann, G., 1813j, 1813k, 1813l
Krzyzanowska, M., 1632
Kuć, J., 1229, 1230
Kujala, V., 1563
Kukolev, P. A., 1787
Kummer, A. P., 2089
Kundert, J., 1358
Kunokami, T., 1201
Kurmanadha Rao, K. V., 2078y
Kurokami, T., 1884

Lafon, J., 1305, 1359
Lagasse, F. S., 1908
Lanfranchi, J., 1703, 1916
Langford, M. H., 2027
Langston, R., 1630
(Lantz, H. L.), 1181, 1470
Larson, R. H., 1528, 1598
Lauenstein, A., 1518
Lauer, E., 1757
Laumont, P., 1567
Lauriol, F., 1886

Lavin, G. I., 1647a
van Leeuwen, E. R., 1383
de Leon, D., 1974
Leonard, C. D., 1840
Leonard, O. A., 1457
Leonardi, C., 1871
Leopold, A. C., 1630
Le Pelley, R., 1996
Leroy, J. F., 1845
Lesley, J. W., 1619
Lesley, M. M., 1619
Lespes, L., 1870
Lewis, D., 1620
Lider, L. A., 1295f
Liger, P., 1618
Limberk, J., 1293
Linskens, H. F., 1145m
List, G. M., 1377
Littauer, F., 1888
Livingston, G. A., 1448, 1483
Ljones, B., 1247
Lock, G. W., 1917
Locsin, C L., 2046, 2050
Locsin, C. S., 2043
Loeffler, E. S., 1435g
Loewel, E. L., 1315
Löhden, A., 1236j
Lona, F., 1112
Long, J. K., 1885
López-Matos, L., 1683
López-Ramos, B., 2076
Loustalot, A. J., 1447, 1450, 1459
Lownsbery, B. F., 1697k
Lownsbery, J. W., 1697k
Lucas, J. W., 1852
Lucas, R. E., 1519
Luckan, J., 1243
Luczakowa, M., 1591
Luddington Experimental Horticulture Station, 1064, 2107
Ludwig, R. T., 1777
Luttrell, E. S., 1363
Lyall, L. H., 1510
Lyamungu Coffee Research and Experimental Station, Tanganyika, 1980
Lynch, L. J., 1586

Ma, R. M., 1890
Maarse, J., 1403
Maas Geesteranus, H. P., 1697d
McCall, G. L., 1475
McCallan, S. E. A., 1435s
McCants, C. B., 1676
McClean, A. P. D., 1858
McCully, W. G., 1485e, 1485h
McFadden, S. E., Jr., 1795
MacFarlane, E. W. E., 1097
McGlumpy, J. H., 1242
McGonagle, M. P., 1648c
McGowan, L. J., 1813d
McIntosh, D. L., 1345
Mackay, J. H. E., 1513
McKee, H. S., 1212
McKeen, W. E., 1352
McKibbin, R. R., 1070
MacLachlan, G. A., 1099
MacLean, J. A. R., 1967
MacNay, C. G., 1435i
MacNeill, B. H., 1577
McNitt, V. J., 1797
McQuade, H. A., 1762
MacWilliam, I. C., 1730
Madras Department of Agriculture, 2108
Madsen, H. F., 1389, 1435j
Maier, A., 1295g
Maĭsuradze, N. I., 1820, 1912j
Malan, E. F., 1819, 1907, 1931, 2078z
Malaya Department of Agriculture, 1915
Mallo, R. G., 1521
Maloney, M., 1573
Malucelli, P., 1152
Manaresi, A., 1306, 1810
Manger, W. H., 1415
Mann, A. J., 1164
Mansfeld, K., 1402
Manzoni, L., 1274
Marchionatto, J. B., 1365
van der Marel, H. W., 1572
Marinet, J., 1702
Marinucci, M., 1236k
Mariotti, A., 1718
Márkus, L., 1571
Marsteller, R. L., 2015
Martin, D., 1218
Martin, D. F., 1395
Martin, H., 1426
Martin, J. A., 1650
Martin, J. P., 1866
Martin, R. P., 1144
Martínez, A., 1978
Mascaranhas, J. P., 2053
Mason, C. M., 1772
Massee, A. M., 1421
Massey, C. W., 1789
Masters, L. C., 1864
Masuda, T., 1556
Mathew, E. C., 1740
Mathur, P. B., 2002
Mattison, J. R., 1650
Mavrich, E. G., 1269
Mayer, A. M., 1615
Maymone, B., 1912k
Meeks, J. W., 1742m
Mehrotra, B. S., 1558
Mellor, F. C., 1345
Menezes Mariconi, F. A., 2020
Mengoli, E., 1810
Merny, G., 1928
Merrill, L. G., Jr., 1520, 1600
(Mertin, J. V.), 1414
Messing, A. M., 1097
Metcalf, J. E., 1076
Middleton, J. T., 1082, 1083, 1085
Mijušković, M., 1912l
Mikeš, J., 1236l
Miles, M., 1542
Miles, P. W., 1684
Miller, E. V., 2015
Miller, L. P., 1435s
Miller, P. R., 1865
Ministry of Agriculture, London, 1078, 1295h, 1296, 1370, 1435k, 1435l, 1435m, 1485i, 1647v, 1813m
Miranda, S., 1957
Misailovski, B., 1260
Mitchell, J. W., 1109, 1110
Mitchell, R. S., 1586
Mizuno, T., 1530
Modugno Pettinari, C., 1904
Monselise, S. P., 1753, 1822, 1841
Montanari, V., 1323
Moore, D. H., 1452
Moretti, A., 1166, 1173
Mori, H., 1153
Morris, G. P., 1564
Morrison, G., 1625
Mort, C. H., 1901
Moss, A. E., 1936
Moss, N., 1527, 1533, 1537, 1612
Mosse, B., 1177
(Mott, R. C.), 1748
Mühendisi, Y. Z., 1663
Mühle, E., 1715
Mühlendyck, E., 1769
Mujica R., F., 1342
Mukherjee, S. K., 2079a
Mulcay, W. D., 1283
Mulder, D., 1303
Müllner, L., 1280
Muma, M. H., 1912m
Münchberg, P., 1408
Mungomery, R. W., 2056
Munnecke, D. E., 1761
Murphy, M. M., 1363
Murray, D. B., 1946, 1949, 1951, 1952, 1954
Muzik, T. J., 1447, 1450, 1459
Myatt, O. W. D., 2079b
Myburgh, A. C., 1384

(N.A.A.S.), 1062, 1063, 1064, 1065, 2107
Nadel-Schiffmann, M., 1887
Naegele, J. A., 1813n
Narasimha Rao, P. L., 1742l
Narasinga Rao, M., 2078y
Narasinga Rao, U., 1798
Narayana, G. V., 1971
Narayanan, E. S., 2059
Narodny, L. H., 1742n
Nasca, A. J., 1869, 1882
Nau, H. H., 1445
Navašin, M. S., 1742o
Naylor, A. W., 1677
Nayudamma, Y., 1739
Neas, I., 1668
Negrulj, A. M., 1277
Nelson, P. E., 1749
Nesterov, Ja., S., 1253
Nethsinghe, D. A., 1972
Nettles, V. F., 1506
Neubert, A. M., 1234
Neumann, G., 1614
Neumann, U., 1237
(Newhall, A. G.), 1515
Newton, J. H., 1377
Newton, W., 1569, 1681
New Zealand Dominion Council of Commercial Gardeners Ltd., 2119c
New Zealand D.S.I.R., 2099
Nicholls, G. A., 1742c
Nickell, L. G., 1114
Nicol, J., 1956
Nicolaisen, N., 1228
Nicolini, J. C., 1903
Nielsen, W. R., 1485j
Nietzke, G., 1464
Nisen, A., 1525
Nizi, G., 1685
Noël James, C., 1978
Noll, C. J., 1490
Noordam, D., 1697d
Noro, K., 1892, 1897, 1899

Northcraft, R. D., 1143
Novickaja, E. I., 1626
Novikov, V., 1131
Novoselova, G. A., 1627
N.S.W. Department of Agriculture, Division of Plant Industry, 1494
N.S.W. Department of Agriculture, Entomological Branch, 1387, 1411, 1644, 1647w
Nutman, F. J., 1970

Odland, M. L., 1490
Ogawa, J. M., 1347
Oines, A., 1382
Olalia, I., 2079l
Olive, F. R., 2054
Oliver, R. W., 1791, 1813o
Olmo, H. P., 1159
Oostenbrink, M., 1549
Orchard, E. R., 1701
Ordish, G., 2090
Orellana, R. G., 1958
Orsenigo, J. R., 1478
Ortega, J. C., 1867

Pablo Duque, J., 1983
Padmanabha Raju, B., 1813p
Palilov, N. A., 1594
Palmer, M. A., 1377
Palmer, R. C., 1222
Palti, J., 1553
Papaïoannou, A. J., 1905
Paredes, A., 1079
Parks, R. R., 1437
Paronjan, G. H., 1273
Parris, G. K., 1647x
Parsons, W. T., 1468
Patel, M. S., 1696
Paton, F. J., 2079c
Patt, Y., 1823
Pattabhiraman, T. V., 1987
Patterson, N. A., 1424
Paturau, J. M., 2061
Pearse, H. L., 1690
Pech, H., 1292, 1894
Peiris, J. W. L., 1955
Pélegrin, P., 1922
Pelluchi, L., 1813q
Pereira, H. C., 1917
Pereira Pinto, G., 1737, 1738
Perez, V. M., 2012
Perkman, O., 1834
Perrier, E., 1337
Persson, A. R., 1623
Pesante, A., 1764
Petelot, A., 1742p
Petersen, E. L., 1677
Pettey, F. W., 1485k
Peyer, E., 1295i
Philpott, J., 1190
Phouphas, C., 1113
Pickett, A. D., 1424
Piemeisel, R. L., 1511
Pieniążek, S. A., 1188
Pierce, W. C., 1371
Pieri, G., 1378
Pillai, V. G., 1700
Pillsbury, A. F., 1145o
Pinelli, A., 1264
Plank, R., 1236m
Plaza Prieto, J., 1893
Plock, H., 1236n
Ploper, J., 1647y
Pogosjan, S. A., 1263
van de Pol, P. H., 1399
Pollard, A., 1236i
Polunin, Ja. Ja., 1562
Ponce, J. R., 1268
Porozov, A. K., 1768
Porritt, S. W., 1222
Portères, R., 1742q
Port Moresby Department of Agriculture, Stock and Fisheries, 2116
Poruckiĭ, Ju. V., 1155
Posnette, A. F., 1328
Potuljnickiĭ, P. M., 1463
Pound, G. S., 1528
Powers, J. B., 1883
Pramer, D., 1555
Preston, A. P., 1236o
Preston, J. F., 2091
Preston, W. H., Jr., 1109, 1110
Prevot, P., 2005
Primrose, C., 1998
Prohorov, N. K., 1830
Pronk, F., 2004
Prosser, D. S., 1880
di Pruna, S., 1271
Purvis, E. R., 1209
Puzzi, D., 1862
Puzzilli, M., 1657

Quackenbush, F. W., 1229, 1230
Quarrell, C. P., 1538
Queensland Bureau of Sugar Experiment Stations, 2037
Queensland Department of Agriculture and Stock, 2109
Queensland Department of Agriculture, Horticulture Branch, 1930
Quick, C. R., 1466

Rademacher, B., 1500
Radha, K., 1579
Raggio, M., 1846
de Raggio, N. M., 1846
Ramcke, C., 2079d
Ramsey, G. B., 1540
Ranasinha, G. O. W., 1767
Ranson, S. L., 1145u
Rao, V. S., 1813r
Ratkovich, M., 1869, 1882, 1912n
Ratner, R., 1906
Ravenscroft, A., 1794
Razvjaskina, G. M., 1697l
Rea, H. E., 1472
Rebandel, Z., 1171
Rebour, H., 2092
Rediske, J. H., 1117, 1119
Redlich, F., 1848
Reed, G. B., 1145d
Reeser, L. G., 2045
Rege, R. D., 2053
Rehbein, C. A., 2047
Reich, H., 1397
Reichert, I., 1859
Reinders-Gouwentak, C. A., 1106
Reinhold, J., 1132, 1616
Rejman, A., 1188
Renaud, P., 1900
Renaud, R., 1959
Resing, W. L., 2030, 2031, 2079e
Reynolds, H. T., 1372, 1523, 1878
Reynolds, T. M., 1215
Rial Alberti, F., 1804
Ribaldi, M., 1366
Ribéreau-Gayon, P., 1295j
Rice, E. L., 1107
Rieman, W. III., 1087
Ritcher, P. O., 1647z, 1771
Ritchie, R. M., Jr., 1695
Rivera H., R., 1935
Rjadnova, I. M., 1186, 1289
Robb, C. J., 1407
Robertson, J. H., 1436
Robinson, B. D., 1468
Robinson, B. P., 1442, 1471
Rock, R. C., 1851
Rod, J., 1742e
Rodgers, E. G., 1458
Rodrígues, G., 1953
Rodrĭguez Berretta, H. T., 1413
Rodriguez Landaeta, A., 1643
Rogalev, I. E., 1504
Rogers, H. H., 1932
Rogers, W. S., 1254, 1435n
Rohrbaugh, L. M., 1107
Rokach, A., 1842
Romero Manrique, A., 2041
Romney, E. M., 1118
Rooyen, C., 1701
Rosa, M., 1636
Rosborough, T., 1545
Rosenquist, E. A., 1942
Rosewarne Experiment Horticulture Station, 1065
Rosillo, M. A., 1868
Ross, E., 1431
Rossin, M., 1077
Rothlin, E., 1393
Roulon, F., 1162
le Roux, M. S., 1285, 1286
Rubber Research Institute of Malaya, 2021
Ruehle, G. D., 2075
Rumbeke-Beitem (Westvlaamse Proeftuin), 2110
Rupert, C. S., 1813v
Russell, J. C., 1145p
Russell, W. A., 1302
Ruszkowska, M., 1631

Saaltink, G. J., 1604
Šaĭtan, I. M., 1192
Säkö, J., 1170
Saleh, A. M., 1641
Saleh, M. S. E., 1732
Salgado, M. L. M., 1972
Sampson, R. E., 1777
Samuels, G., 1802
Sánchez-Nieva, F., 2076
Sancier, K. M., 1145s
Sander, A. F., 1784
Sanders, F. R., 1917, 1980
Sandwith, N.Y., 2078c
Santa Barbara Botanic Garden, California, 2119h
Saponaro, A., 1361
Sapožkov, I. A., 1176
Sarawak Department of Agriculture, 2119i
Sarejanni, J. A., 1905

Šaškin, I. N., 1251
Sastri, R. L. N., 2079g
Sato, K., 1208
Sauer, M. R., 1833
Saulsbury, A. O., Jr., 1582
Saunby, T., 2093
Sayeed, P. M., 1971
Scaramuzzi, G., 1301, 1310
Schaffe, P. S., 1890
Scheidecker, D., 2005
Schenker, H. H., 1087
Schetters, C., 1433
Schmid, H., 1742k
Schmidt, H., 1349
Schmidt, H.-H., 1570
Schmidt, M., 1156
(Schomer, H. A.), 1227
Schopp, R., 1581
Schroeder, C. A., 1891
Schroo, H., 2052, 2079f
Schuphan, W., 1213
(Schuppe, E.), 1243
Schwabe, W. W., 1813s
Schwalen, H. C., 1130
Schwemmle, B., 1092
Scofield, H. T., 1673
Scott, R. A., 1294
Seale, C. C., 1726
Searcy, V. S., 1467
de Segura, C. B., 1735
Selders, A. A., 1119
Selle, R. M., 1826
v. Sengbusch, R., 1243
Senn, T. L., 1650
Sergeeva, K. A., 1898
Sergeeva, K. D., 1238
Seshagiri, P. V. V., 2079g
Shankar, J. V., 1088
Sharpe, R. H., 1291
Shaw, M., 1099
Shear, S. W., 1236p
Shedley, D. G., 1875
Shelford, K. O., 2070
Shepherd, K., 1921
Shivas, J. A., 1127
Shoji, K., 1923
Shuel, R. W., 1127
Sibilia, C., 1360, 1362
Siegelman, H. W., 1790
de Silva, C. A., 2022, 2024
Siminovitch, D., 1811
Simmonds, F. J., 1927
Simmonds, N. W., 1927, 2079h
Simonov, I. N., 1239
Singer, S. J., 1145e
Singh, K. K., 2002
Singh, R. S., 1592
Sirdeshmukh, K. B., 1813r
Skellon, J. H., 1734
Ślaski, J., 1187
Smallwood, N. W., 1145q, 1145r
Smeets, L., 1106
Smit, B., 1435o
Smith, A. J., 1912o
Smith, C. F., 1435p
Smith, C. N., 1233
Smith, G. F., 1108
Smith, L. C., 1311
Smith, M. A., 1540
Smith, P. F., 1838
Smith, R. H., 2032, 2033
Smith, R. J., Jr., 1451
Snapp, O. I., 1396
Sneep, J., 1524, 1648a
Snoad, B., 1813t
Snow, R., 1742r
Snyder, F. W., 1439
Snyder, W. C., 1435f
Sockalingam, T., 1942
Soenen, A., 1338, 1392
Solomon, M. E., 1422
Somos, A., 1532, 1534
South African Sugar Association, 2038
(Southern Rhodesia Tobacco Research Board), 1651, 1662, 1666, 1671
Spanner, D. C., 1100
Sparrow, A. H., 1095
Speer, R. J., 1573
Spence, J. W., 1734
Spencer, E. L., 1546, 1634, 1648b
Spencer, H., 2018
Špilenja, S. E., 1708, 1709, 1717
Spivakovskiĭ, N. D., 1204
Spoelstra, P. A., 1136
Sporer, A. H., 1145s
Spurlock, A. H., 1489
Sreenivasaya, M., 1742b
Srinivasan, M., 1721
Srivastava, A. N., 1696
Stace-Smith, R., 1334
Staehelin, M., 1322
Stalder, L., 1356
Stamper, E. R., 1476
Staniland, L. N., 1776
Steinberg, R. A., 1660, 1697m
Steiniger, F., 1409
Steinmetz, E. F., 2094
Stellwaag, F., 1304
Stenning, L., 2025
Sterling, C., 1236q
Stewart, I., 1840
Stinson, F. A., 1651, 1662, 1666, 1671
Stirrett, G. M., 1697h
Stoev, K. D., 1276
Stoll, K., 1219
Stone, L. E. W., 1759
Storer, T. I., 1404
Storey, W. B., 2010
Storrs Agricultural Experiment Station, Connecticut, 2097
Stoutemyer, V. T., 1781, 1813u
Strachan, C. C., 1236b
Street, H. E., 1105, 1116, 1648c
Strickland, A. G., 1072
van Suchtelen, N. J., 1993
Sudan Ministry of Agriculture, Research Division, 2119j
Suit, R. F., 1865
Sunday, M. B., 1847
Swank, G., Jr., 1547
Swanson, C. L. W., 1124
Swanson, C. P., 1813v
Swift, J. E., 1523
Swingle, M. C., 1446
Sykes, M. T., 1223
Sykes, S. M., 1225, 1226
Sysoev, A. T., 1877

Taboada, V. L., 1831, 1860
Tanganyika Coffee Research and Experimental Station, Lyamungu, 1980
Tarasenko, M. P., 1185
Tarr, H. L. A., 1216
Tatchell, A. R., 1731
Taylor, E. H., 1145o
Tegethoff, B., 1145t
Temme, J., 1572
Ten Houten, J. G., 1343
Terrier, C., 1322
Théau, —., 1751
Thiem, H., 1211, 1433, 1435q, 1435r
Thimann, K. V., 1145k
Thomas, D. W., 1129
Thomas, M., 1145u
Thomas, W. D., Jr., 1813h
Thompson, A. H., 1165
Thomson, R., 1697n
Thompson, W. L., 1872, 1873
Thorold, C. A., 1960
Tidbury, G. E., 1917
Tihonov, N. N., 1236r
Tinsley, T. W., 1680
Tjutjunik, A. F., 1278
Tkačenko, F. A., 1557
(Tobacco Research Board of Southern Rhodesia), 1651, 1662, 1666, 1671
Tocquigny, J. R., 1448
Tolba, M. K., 1641
Tomlinson, J. A., 1296
Toohey, C. L., 2079i
del Tosta Filho, I., 1932
Toth, S. J., 1118
Trébuchet, G., 1565
Trenkle, R., 1179
Trinidad and Tobago Department of Agriculture, 2079j
Trojer, H., 1986
Trout, S. A., 1225, 1226, 1930
Tschermak-Seysenegg, E., 1763
Tukey, L. D., 1438
Tunblad, B., 1373
Turica, A., 1386, 1912p
Turković, Z., 1295k
Turnbull, J., 1374
Turžova, M. P., 1279
Tysser, H. F., 2111

Uhlig, S., 1086
Ulrich, R., 1191
Universidad Central del Ecuador, 2118
Urbach, G. E., 1212
U.S. Department of Agriculture, 1066, 1648d
Uzziel, M., 1853

Vaile, J. E., 1252
Vallaeys, G., 1938, 1995
Vallance, L. G., 2079k
Vanderwalle, R., 2112
Varley, G. C., 1423
Vaughan, E. K., 1334, 1602
Vaughan, J. G., 1813w
Veerman, J. A., 1778
Vega, J., 1266, 1269
Venjjaminov, A. N., 1158
Ventura, T., 2079l
Verduin, J., 1098
Verduyn, H. A., 1724
Vergani, A. R., 1874, 1879
Vergara Castillo, C., 1336
Vesey-Fitzgerald, D., 1975
Vetušnjak, L. F., 1550

Vierheller, A. F., 1165
Vilardebo, A., 1919, 1928
Vinnik, A. G., 1550
Visschers, A. J., 1151
van der Vliet, M., 1585, 1648e
Vlitos, A. J., 1441
Voblikova, T. V., 1850
Voelcker, O. J., 1937
Vogel, W., 1394
Volk, G. M., 1659, 1689
Vollema, J. S., 2023
Vuillaume, M., 1919

Wadsworth, R. V., 1932
Wageningen "De Lange Ossekampen", 2119g
Wageningen, Instituut voor Tuinbouwtechniek, 1067
Wageningen, Plantenziektenkundige Dienst, 1401, 1410, 1583, 1699, 2119k
Wager, V. A., 1648f
Waggoner, P. E., 1639, 1640
Wahlin, B., 1427
Wain, R. L., 1419
Wainstein, P., 1559, 1561, 1714
Waite Agricultural Research Institute, 2119 l
Waite Agricultural Research Institute, Department of Entomology, 1785
Walker, J. C., 1509, 1528, 1598
Walker, T. K., 1732
Wallace, J. M., 1816
Wallace, J. O., 1609
Walter, J. M., 1647r
Walzel, G., 1742s
Wang, C. H., 1145v
Wareing, P. F., 1145w
Warne, L. G. G., 1486
Washr, P., 1742k
Wasowicz, T., 1939
Watson, R. D., 1580
Wattle Research Institute, 2119m
Webb, D. v. V., 1736
Weed, R. M., 1435s
Wehunt, R. L., 1209
Weijel, M. L., 1752
Wellendorf, M., 1648g
Wellman, F. L., 1994
Wells, J. S., 1796, 1812
Wertheim, A., 1632
Wessel, G., 1120
West, E. S., 1834
Wester, R. E., 1125
Westerhof, J. J., 1122
Westgate, P. J., 1502
de Wet, A. F., 1161
de Wet, J. M. J., 1765
van Wetswinkel, G., 1392
Weybrew, J. A., 1694
Whitaker, T. W., 1613
Wickens, R., 1967
Wierszyłłowski, J., 1169
Wiggins, L. F., 2065
Wijeratne, W. M., 1675
Wikesjö, K., 1406
Wildman, S. G., 1145e
Wilhelm, S., 1697o, 1749, 1758
Williams, A. H., 1236i
Williams, G., 1962
Williams, O., 1438
Williamson, C. E., 1755
Wills, J. M., 1920
Wilner, J., 1184
Wilson, D. J., 1254
Wilson, J. W., 1648h
Wilson, R. W., 1673
Wiltshire, G. H., 1575, 1648i
Winchester, J. A., 1458
Wing, R. E., 1103
Wisconsin Agricultural Experiment Station, 2113
Wise, C. T., 2079m
de Witt, K. W., 1968, 1969
Witte, K., 1313
Wittwer, S. H., 1617
Woess, F., 1495
Wohlmuth, N., 1295d
Wolfenbarger, D. O., 2018
Woltz, W. G., 1484, 1673, 1676
Wood, R. D., 1507
Woodcock, D., 1417
Wooley, P. H., 1334, 1353
Wright, D. W., 1543
Wright, W. J., 1527, 1533

Yale, J. W., Jr., 1602, 1606
Yarwood, C. E., 1101
Yashiroda, K., 1792
Yoffe, J., 1859
Yost, H. T., Jr., 1813v

Zaar, Ė. I., 1809
Zachos, D. G., 1578
Zaharova, E. I., 1316
Zaliwski, S., 1205
Zavackaja, E. A., 1193
Zechmeister, L., 1089
de Zeeuw, D., 1093
Zentmyer, G. A., 1817
Zeumer, H., 1416
Zinkiewicz, J., 1631
Zippelius, H., 2095
Zlatkovsky, A., 1526
Zonderwijk, P., 1479
Zuluaga, P. A., 1265, 1268

**Wanted** by a client, Technical Communication No. 2, "Field Experiments in Horticulture", by T. N. Hoblyn. 2s., March 1931.

Will anyone able to supply a copy, please write to the bureau?

# INDEX

**H.A. Vol. 24. No. 3.**

N.B.—Brackets round the name denote that this person, although not the author, was directly or indirectly concerned with the article.

Abbott, D. L., 2284
Åberg, E., 3282
Abiusso, N., 3083
Adams, R. E., 2535
Adsuar, J., 3269a, 3269s
Agassiz, Dominion Experimental Farm, British Columbia, 3295
Agricultural Research Council [London], 3296
Ahlers, N. H. E., 2322a
Ahrendt, L. W. A., 2990
Aiyadurai, S. G., 3143, 3269b
Alagna, N., 2358
Alben, A. O., 2386
Alcaraz-Mira, E., 2852
Aldebert, —., 2348
Aldrich, R. J., 2556, 2587, 2593
Alexander, L. J., 2838a
Allam, M. E., 2466
Allard, R. W., 2680, 2702
Allen, F. W., 2293
Allen, O. N., 2687
Allmendinger, D. F., 2498
de Almeida, J. R., 3208
Alpatjev, A. V., 2791
Alvarez-García, L. A., 3185
Alvim, P. de T., 3128, 3153
Amling, H., 2592
Amphoux, M., 2471
Anantanarayanan, K. P., 3140
Anderson, E. D., 2621a
Anderson, J. C., 2208a
Anderson, W. H., 2745
Anderson, W. S., 2659
Anderssen, F. G., 2622
Andronov, N. M., 2984
Anjou, K., 2419, 2420
Anley, D., 2196
Anon., 2128, 2190, 2203, 2208b, 2214, 2475, 2715, 2744, 2815, 2838b, 2840, 2851, 2859, 2920, 2922a, 2964, 3069, 3100b, 3100c, 3121, 3181, 3227, 3238, 3257
Anthon, E. W., 2432
Archibald, J. F., 3122
Arizona Agricultural Experiment Station, 3323a
Ark, P. A., 2443, 2445
Arthington, W., 2322h
Arvan, P. G., 2183
von Arx, J. A., 2768
Arzee, T., 3100d
Asen, S., 2939, 2948
Ashour, W. E., 2466
Askew, H. O., 2863, 2897
Asociación de Técnicos Azucareros de Cuba, 3197
Asquith, D., 2545a
Atkins, F. C., 2727
Atmore, S., 2946
Aughtry, J. D., 3212, 3215
Ayers, A. D., 2753

Bacon, O. G., 2494
Bagenal, N. B., 2210
Bagnall, B. H., 2489
Bahtadze, K. E., 3244
Bajwa, B. S., 3100e
Baker, G. A., 2132
Baker, K. F., 2953, 2982, 3011a
Baker, R. E., 2132, 2264
Bakhuizen, H. L. van de Sande, 2156
Balcom, R. B., 2571
Bald, J. G., 2965
Balks, R., 2136
Baltadori, A., 2224
Banga, O., 2762
Bangdiwala, I. S., 3239, 3270k
Bannerman, L. W., 2587
Barger, W. R., 2833
Barnsley, G. E., 2898
Barth, T., 3271
Barua, P. K., 3243
Baskin, A. D., 2563, 2620
Basutoland Department of Agriculture, 3323b
Batchelor, L. D., 3044
Batjer, L. P., 2285, 2403
Bauckmann, M., 2504
Baumann, G., 2701
Baumeister, G., 2456
Baumgardt, J. P., 2826
van Bavel, C. H. M., 2850
Baver, L. D., 3225, 3269c
Bawden, F. C., 2855
Baxter, L. W., 3011b
Bazzi, B., 3055
Beater, B. E., 3221
Beatty, R. H., 2579
Beaumont, A., 2823
Beaverlodge Dominion Experimental Station, Alberta, 3297
Becker, H., 2208c
Beckley, M. S., 2575
Bedsole, M. R., Jr., 3211
Beier, R. L., 3100o
Beijer, J. J., 2963
Belić, A., 2208d
Bell, K. E., 2260
Belloni, V. G., 2454, 2519
Beltrán Galindo, G., 3106
Bensa, S., 2966
Benvegnin, L., 2378
v. d. Berg, C., 2129
Bergann, F., 3003
Berger, K. C., 2208h, 2687
Bernard, G. E., 2562
Bernard, J., 2545b
Bernhard, R., 2255
Bernon, G., 2471
Bernstein, L., 2753
Bervillé, P., 2511
Beyers, E., 2399
Bezlur Rahman, M., 2303
Bezzi, E. M., 2652
Bhatia, B. S., 3046
Bhatnager, V. B., 2771
Bianchedi, A., 2360
Biebl, R., 2184
Bing, A., 2994
Bingham, F. T., 3015, 3068
Biologische Bundesanstalt Braunschweig, 2398
Birk, H., 2349
Biron, M., 2352
Bishop, C. J., 2229
Bisset, N. G., 2922b
Bitters, W. P., 3044, 3100f
Bixby, D. H., 2650
Blackmon, G. H., 2387
Blaha, J., 2395a
Blair, B. O., 2580
Blake, C. E., 2302
Blanchet, R., 2407
Blankholm, E., 2627
Blasberg, C. H., 2277
Blasse, W., 2322m
Blaszinsky, J., 2208c
Blommaert, K. L. J., 3079
Blunck, H., 3272
Boawn, L. C., 2693, 2694
Boek, K., 2405
Böhm, H., 2495, 2506
Böhm, O., 2954
Boland, P., 3013
Bolgarev, P. T., 2361
Boll, W. G., 2208y
Bolle-Jones, E. W., 3192
Bolton, A. T., 2470
Bömeke, H., 2292, 2415
Bonfante, S., 3086
Bongiovanni, G. C., 2453, 2492
Bonner, J., 2160, 3273
Bontovits, L., 2795
Borck, B., 2248, 2418
Bordeleau, R., 2567
Borders, H. I., 2664
Borgman, H. H., 2250
Borzini, G., 2724
Bottini, E., 2316
Bottrell, P. C., 2322b
Boubals, D., 2483
Bouillenne, R., 2797, 2798
Bouillenne-Walrand, —., 2737
Bould, C., 2177
Bouvet, E., 3242

Boyes, W. W., 3092
Boynton, D., 2276
Braadlie, O., 2270
Bradley, R. H. E., 2854
Bramble, W. C., 2577
Bramley, W., 2211
Brannaman, B. L., 3047
Break, R. A., 2503
Breggar, T., 3211
Breider, H., 2351, 2363
Brett, C. H., 2707
Breviglieri, N., 2239, 2262, 2353
Brewer, H., 2838c
Brežnev, D. D., 2787
Brian, P. W., 2545c
Brichet, J., 3082
Bridgland, L. A., 3127
Brierley, P., 3011c, 3011d
Brindley, T. A., 2706
Brink, V. C., 3011e
British Columbia Department of Agriculture, 3323c
British Columbia Vegetable Breeders' Committee, 2623
British Weed Control Conference, 2547
British West Indies Sugar Association, 3198
Broadbent, B. M., 3064
Brook, P. J., 2464
Brown, D. S., 2222
Brown, E., 2879
Brown, H. B., 3123
Brown, H. D., 2807
Brown, J. W., 2552
Brown, N. C., 2922c
Brown, R., 2145
Brozzetti, P., 2915
Brubaker, R. W., 2707
Brückbauer, H., 2512
Bruder, J., 2749
Bruehl, G. W., 3269d
Brusca, J. N., 3014, 3027, 3028, 3036, 3100f
Buchloh, G., 2427
Buck, G. J., 2979
Bulat, H., 3011n
Bullen, E. R., 2690
Bundesanstalt für Qualitätsforschung Geisenheim, 2137, 2301, 2329, 2658, 2660, 2662, 2803, 3298
Bünsow, R., 2208q
Bunt, A. C., 2187
Burleigh, C. H., 3240
Burr, G. O., 3214
Burris, R. H., 2154
Burström, H., 2208e
Burton, J. C., 2687
Busch, W., 2628
Businger, J. A., 2424
Butijn, J., 2209a
Butler, J. R., 2208f
Butler, L. I., 2542
Buxton, E. W., 2699
Byass, J. B., 2538
Byrnes, W. R., 2577

Cabo Torres, J., 2888
Cadman, C. H., 2434
Cain, J. C., 2267, 2268
Cairaschi, E. A., 2860, 2922d
Cairns, E. J., 2740, 2741
Calavan, E. C., 3053
Calle, H., 3269e
Calvert, A., 2166
Camp, A. F., 3019
Cangardel, H., 2914
Canitano, D., 2347, 2663
Capo, B. G., 3270k
Capucci, C., 2367
Carew, J., 2808
Carli, A., 2472, 2476
Carlson, R. F., 2583, 2591
Carolus, R. L., 2745
Carpenter, W. J., 3007
Carra, P., 2955
Casimir, J., 2208r, 2736
Castaño A., J. J., 3168
Cavell, A. J., 2143
Cavill, G. W. K., 2208g
Cehmistrenko, V. F., 2669
Čekotillo, A. M., 2315
Cerbulis, J., 3124
Černenko, E. S., 2261
Ceruti, A., 2322c
Chadwick, L. C., 2997
Chambers, J., 2435
(Champignons, Centre de Recherches sur les, Gembloux), 2710
Chancogne, M., 2521, 2522
Chandler, B. V., 3075
Chandler, P. A., 2944
Chandler, S. E., 2899
Chandra, G., 2881
Chapot, H., 3100g
Chappell, W. E., 2594
Chappuis, E., 2199
Chatt, E. M., 3274
Chevalier, A., 2322d, 2322e, 2901, 3100h
del Chiaro, G., 2819
Chopra, R. N., 2838d
Chouard, P., 2907
Choudhri, R. S., 2771
Choudhury, J. K., 2890
Chowdhury, S., 3059
Christ, E. G., 2428
Christensen, H., 3280
Chroboczek, E., 2750
Ciferri, F., 2410, 2780
Ciferri, R., 2440
Čitašvili, S. Š., 3093
Clark, B. E., 2924
Clark, P. J., 2543, 2825
Clark, T. F., 2321
Clarke, B. W., 2134
Clements, H. F., 3213, 3222
Close, A. W., 2169
Coconut Research Institute Ceylon, 3142, 3269f
Coen, E., 3166
Cohen, A., 3045
Cole, J. R., 2481
Collins, W. B., 2330
Colombia, Facultad de Agronomia, Palmira, 3311
Comin, D., 2306
Comité National pour L'Étude de la Culture Fruitière, Belgique, 2213
Commercial Grower, 3275, 3321
Commonwealth Economic Committee, 2892
Commonwealth Institute of Biological Control, 2545d
Connor, J., 3041
Conseil des Academies de la R.P.F. de Yougoslavie, 3322
Cook, J. A., 2779
Cook, R. L., 2949
Cooke, A. R., 2150
Cooke, G. W., 2690
Cooper, W. C., 3038, 3039
Cornuz, L., 2993
Correa, R. T., 2613, 2676
Cosmo, I., 2359
Cota Galan, R., 2866
Couraud, J., 2678
Courshee, R. J., 2201, 2536, 2537, 2538
Courtney, W. D., 2921
Coutan, —., 2641
Coutant, R., 2281
Cowley, W. R., 2973
Cox, R. S., 3011f
C.P.V. Experiment Station, Indonesia, 3318
Craft, C. C., 2832
Crafts, A. S., 2549
Crandall, P. C., 2338
Crandall, P. R., 3100p
Crane, F. L., 2792
Crane, H. L., 3095
Crane, J. C., 2264, 2295
Crawford, C. L., 2693, 2694
Cree, C. B., 3042
(Creech, J. L.), 2170
Cressman, A. W., 3064
Cruickshank, I. A. M., 2755
Cuatrecasas, J., 3269g
Cueto Robayna, C. B., 3223
Cunene Experiment Station, 3299
Currence, T. M., 2838e
Cutter, V. M., Jr., 3269h
Cutter, Y., 3054
Cuvier, P., 3179

DaCosta, G. C., 2682
Dadant, R., 3148, 3165
Dadd, C. V., 2690
Dahlmeyer, W. H. M., 2499
Daines, R. H., 2516
Danielson, L. L., 2560, 2601
Danish Seed Testing Station, 3323d
Dansk Gartnerforening, 3276
(Danvig, A. M.), 3276
Darpoux, H., 2545e
Darrow, G. M., 2323, 2332
D[as], G. M., 3269i, 3269j
Datta, R. M., 3011g, 3269k
Dauple, —., 2641
Davel, H. B., 3021
Davidson, J. H., 2343
Davidson, R. W., 2448
Davies, E. de L., 3164
Davies, J. N., 2644
Daviknes, T. B., 2759
Davis, C. S., 2493
Davis, E. W., 2804
Davis, L. H., 2953
Davis, T. A., 3269l, 3269m
Davison, J. R., 3017
Dawson, R. B., 3277
Day, B. E., 2559, 2565
Dayton, D. F., 2545f, 2545p
Dean, F. P., 2486
Dean, H. A., 3065
Dean, L. A., 3043

DeFrance, J. A., 2585, 2586
DeGarmo, E. P., 2200
Degman, E. S., 2272
Delmas, H. G., 2255
Delmas, J., 2719
Denisen, E. L., 2338, 2342
Dennison, R. A., 2689
Dermine, E., 2269
Dermott, W., 2395b
Deszyck, E. J., 3049
Detroux, L., 2606
Devjatov, A. S., 2257
Devuyst, A., 3269n
Dewey, A. W., 3011h
DeWolfe, T. A., 3066
Dible, W. T., 2208h
Dickert, H. W., 2457
Dijksterhuis, H. P., 2451, 2545s
van Dillewijn, C., 3235
Dimond, A. E., 2545g
Dini, M., 2789
Dinkla, P. E., 2208t
Diry, —., 2348
Dobrovoljskií, A. N., 2395c
Dodge, C. W., 2917
Doehlert, C. H., 2545h
Dolan, D. D., 2605
Doll, C. C., 2338
Dominica Department of Agriculture, 3323e
Donadoni, S., 2864
Doorenbos, J., 2174, 2956
van Doorn, A. M., 2756, 2757
Doucette, C. F., 3011i
Dreibrodt, L., 2637
Dropkin, V. H., 2829
DuCharme, E. P., 3016
Duddington, C. L., 2830
Dühr, —., 2380
van Duin, R. H. A., 2195
Duisberg, P., 2868
Dukeshire, N. W., 3100f
Duncan, C. W., 2838g
(Dunegan, J. C.), 2442
Duque, J. G., 3278
Dutt, J. O., 2838f
Dutta, S., 3170
D[utta], S. K., 3256, 3258, 3263, 3269q
Dye, D. W., 2447, 2822
Džorbenadze, A. M., 3023

Easley, L. W., 2560
East Africa High Commission, 2900, 3323f
Eastwell, B. A., 2208i
Eastwood, T., 2582
Eberhardt, F., 2168
Eberhardt, G., 2208j
Eden, T., 3250
Edgerton, L. J., 2294, 2369
Edwards, R. I., 2799
Edwards, R. L., 2726, 2728, 2729, 2735, 2838g
Eggert, F. P., 2225
Eide, C. J., 2838e
(Eidg. Statistisches Amt, Bern), 2212
Embleton, T. W., 3035
van Emden, J. H., 2164
Emmert, F. H., 2231
Enderud, J., 3012, 3100v, 3100w
Endrigkeit, A., 2665
Engel, R. E., 2587
Engels, L., 2737, 2738
English, R. D., 2322f
Erickson, A. E., 2949
Erickson, L. C., 3047
Ernst, E., 2418, 2748
Ervin, J. O., 3029
Escalante, M. G., 2922e
Escritt, J. R., 2589, 2974
European Plant Protection Organisation (EPPO), 2487
Evenari, M., 2776
Evreinoff, V.-A., 2235

de Faestraets, L., 2606
Fast, G., 2185
Fazlullah Khan, K., 3264
Feinbrun, N., 2957
Félix, L., 2681
Fernando, L. H., 2886
Fernqvist, I., 2545i
Ferwerda, F. P., 3154
Filinger, G. A., 2245
Filipek, H., 2675
Fink, H. C., 2962
Fiori, G., 3090
Fischer, A., 2208k
Fjelddalen, J., 2491, 2759
Flaig, W., 2158
Flegg, P. B., 2726, 2734
Fleming, W. E., 2653
Fletcher, R. F., 2607, 2838f
Fletcher, W. A., 3072
Flint, H. L., 2948
Flippin, R. S., 3117
Floor, J., 2204
Foley, F. B., 2650
Folley, R. R. W., 2218
Food and Agriculture Organization [FAO] of the United Nations, 3323g
Ford, D. L., 2208g
Forester, M. B., 2395d
Fors, A. L., 3207, 3219
Forshey, C. G., 2259
Forti, G., 3114
Fortún, C. M., 3241
Foskett, R. L., 2752
Fossum, M. T., 2127
Fouarge, M., 2797, 2798
Foucart, G., 3169
Fouqué, A., 3112
France, V. A., 2601
Francot, P., 2395e
Frans, R. E., 2556
Frazier, N. W., 2436, 2437
Freed, V. H., 2597
Freeman, B., 3269h
Freeman, G. H., 2131
Freeman, J. A., 2985
Freitag, J. H., 2437
Frézal, P., 2348
Friedrich, G., 2251
Frolich, E., 3034
Fronmuller, W. A., 2981
Frost, H. B., 2952
Fudge, O. L., 2574
Fujii, T., 2252
Fukunaga, E. T., 2704
Fuller, C. E. K., 2996
Fuss, F., 2418

Gaarder, P., 3011j
Gabrielsen, E. K., 2208l
Gabryl, T., 2750
Gagnard, J., 2385
Galston, A. W., 3273
Gammon, N., Jr., 2387
Gandy, D. G., 2838g
García Becerra, C., 3120, 3134, 3135, 3138, 3269o
Gardner, H. W., 3279
Garinei, D., 2864
Garner, H. V., 3279
Garren, K. H., 3001
Garren, R., 2695
Gärtel, W., 2404
Gast, A., 2500, 2947n
Gaudineau, M., 2452
Gäumann, E., 2148
Gausman, H., 3100q
Gausman, H. W., 2613, 2676, 2973, 3037
Gavrilkević, B. B., 2368
Gehring, F., 2838h
Geissman, T. A., 2208m, 2950
van Geit, P., 2545j
Geljfandrein, P. S., 2300
George, D. K., 2621b
Georlette, R., 2322g
Gericke, S., 2208n
Gesell, S. G., 2986
Gibbs, M., 2167
Gifford, J. C., 2621c
Gigante, R., 2858
Giori, G., 2220
Giovagnotti, C., 2847
Giovannini, E., 2317
Giovannozzi, M., 2849
del Giudice, E., 2357
Gjaerum, H. B., 2460
Glendening, G. E., 2580
Glenn, K., 3025
Glonti, M. D., 2125
Glover, J., 2189, 2900
Glover, P. M., 3254, 3256, 3258, 3261, 3262, 3263, 3269p, 3269q
Gobbato, C., 2355
Goetsch, W., 2786
G[okhale], N. G., 3269r
González Ríos, P., 3269s
Goodman, R. N., 2441
Gorbatjuk, D. A., 2283
Gorenz, A. M. 3195
Gossweiler, J., 3103
Gould, C. J., 2968
Graham, T. W., 2648
Granhall, I., 2226, 2230, 2232
Graniti, A., 2474, 2545k
Green, V. E., Jr., 2202
Greenham, C. G., 2155
Greulach, V. A., 2153
Griffiths, F. P., 3100i
Griggs, W. H., 2208o
Grill, F., 2208p
Grillot, G., 2909
Grison, P., 2522
Gross, C. R., 2276
Gross, R. A., 3269t
Groven, I., 3280
Guba, E. F., 2463
Gude, C. J., 3160
Guernsey, F. S., 2157
Guiochon, P., 2718
Gulińska, M., 2675
Gunther, F. A., 3100o
Gupta, G. N., 2881
Gurgel, J. T. A., 2911

Gutiérrez Z., G., 3162
Gutnikova, Z. I., 2871
Gutter, Y., 3054
Guyot, H., 3112

Haag, H. B., 2526
Haas, A. R. C., 3014, 3027, 3028, 3036
de Haas, P. G., 2217
Haesloop, J. G., 2153
Haeussler, G. J., 2649, 2758
Häfliger, E., 2528
van Haga, P. R., 2922f
Hagiya, K., 2766
Hahn, P., 2838i
Hale, E., 2489
Hall, C. B., 2809
Hall, J. A., 2554
Hallbauer, E., 2180
Hamashima, N., 2661
Hamilton, J., 2373
Hamilton, R. A., 3269u
Hammar, H. E., 2386
Hamner, C. L., 2149, 2206, 2621g
Hand, D. B., 2838j
Hanna, A. D., 3132
Hänsel, H., 2685
Hard, M. M., 2524
Harder, R., 2208q
Hardman, J. A., 2545l
Hardy, R., 3104
Hargreaves, G. H., 3269v
Harmon, F. N., 2365
Harris, W. D., 2545m
Harrison, B. J., 2632
Harrison, C. J., 3246
(Harrison, C. M. D.), 2900
Hartley, G. S., 2525
Hartmair, V., 2381
Hartmann, A., 2305
Hartmann, H. T., 3078, 3080
Haskew, H. C., 3201
Hauser, E., 2730, 2739
Havis, J. R., 3153
Hawthorne, P. L., 2462
Hay, J. R., 2578
Heaton, E. K., 2388
Heggli, M., 2545n
Heimlich, G., 2307
Heinemann, P., 2711, 2736, 2738
Heinisch, K. F., 3191
Heinze, P. H., 2832
Hemphill, D. D., 2287, 2441
Henriksen, A., 2838k
Hess, H., 2922g
Hewitt, E. J., 2763
van der Heyden, S. J., 2208t
Heymann-Herschberg, L., 3033
Hibberd, N. V., 2683
Hilborn, M. T., 2459, 2517
Hild, G., 2716
Hildebrand, E. M., 2430, 2838l
Hill, E. C., 3074
Hiller, W., 2162
Hills, C. H., 2541
Hinman, F. G., 2706
Hinsvark, O. N., 2939
Hirota, N., 2884
Hirst, J. M., 2192
Hitchcock, A. E., 2621k
Hitz, C. W., 2280, 2592, 2595, [2596
Hochhausen, I., 2889
Hodgson, J. M., 2573
Hodgson, R. W., 3100j
Hoffman, M. B., 2294
von Hofsten, C. G., 3281
Hogan, T. W., 2497
Holdeman, Q. L., 2648
Holley, W. D., 2935
Holliday, P., 3119
Holly, K., 2550
Holman, J. C. M., 2182, 2643
Holmes, A. D., 2673
Holmes, R. L., 3099
Honda, N., 2395f
Hoover, M. M., 2838a
Hoover, M. W., 2689
Hopkins, B., 2133
Horber, E., 2545o
Hord, H. H. V., 3117
Horn, C. L., 3151
Horn, N. L., 2462
Horn, W., 3011k
von Hösslin, R., 2770
Hough, L. F., 2545f, 2545p
Howarth, G., 2688
Howell, R. W., 2152
Howlett, F. S., 2231
Hsu, R., 2998, 3005
Hu, C. C., 3022
Huber, H., 2534
Hudson, N. M., 2708
Huffaker, C. B., 2490
Hughes, C. G., 3285
Huglin, P., 2477, 2478
Hullen, E., 2721
Hulme, A. C., 2304, 2308, 2309, 2322h
Humbert, R. P., 3269c, 3269w
Humphreys, F. R., 2875
Hunsinger, E. J., 2207
Hunter, A. W. S., 2228
Husch, B., 3010
Hussain, R., 3203
Hutchinson, M. T., 2510
Hutton, K. E., 2455
Huygens, R., 2208r
Huysmans, C. P., 3259

Imazu, T., 2413
Imperial College of Tropical Agriculture, 3109, 3118, 3323h
Indian Agricultural Research Institute, New Delhi, 3300
Indian Coffee Board, 3152, 3156
Indian Tea Association, Tocklai, 3245
Indonesia, C.P.V. Experiment Station, 3318
Institut des Fruits et Agrumes Coloniaux [I.F.A.C.], 3102, 3115, 3182
Institut National de la Recherche Agronomique, 3301
Institut de Recherches pour les Huiles et Oléagineux, 3176
Institute of Brewing, 2895
International Botanical Congress, Stockholm, 3282
International Congress on Vines and Wine, Seventh, 2346
International Society of Sugar Cane Technologists, 3196
Ireland, Department of Agriculture, 3323i
Isleib, D. R., 2593
Islip, H. T., 2879, 2891
Istituto di Frutticoltura e di Elettrogenetica, Roma, 3283, 3284
Italy, Istituto per il Commercio con l'Estero, 2219
Ito, H., 2667
Iwai, S., 2938
Iwama, S., 2661, 2777, 2781, 2938
Iwata, M., 2640

Jacks, H., 2543, 2755, 2825
Jacob, A., 2180
Jacob, W. C., 2553
Jacobson, H. G. M., 2646
Jamison, F. S., 2809
Jan, M. O., 3203, 3204
Jancke, O., 2512, 2518, 2545q
Jannone, G., 2414
Jaramillo Arango, R., 3133
Jennings, E. G., 2191
Jensen, F., 2503
Jeppson, L. R., 3060
Joachim, A. W. R., 2885
Johansson, E., 2227, 2331
John Innes Horticultural Institution, 3302
Johnson, B. L., 2950
Johnson, L. F., 3236
Jones, J. F., 2465
Jones, M. A., 3164
Jones, P. A., 3157
Jones, W. W., 3035, 3042
de Jong, P., 3260, 3269x
Jorgensen, E. C., 2950
Josepovits, G., 2514
Joshi, N. V., 3265
Joshi, S. G., 3265
Josifović, M., 2467
Joslyn, M. A., 2303
Jovanović, B., 2569
Junges, W., 2418, 2782
Junnila, W. A., 2865

Kaleganov, A. A., 2421
Kaltofen, H., 2130
Kammeyer, H. F., 2418
Kämpfe, L., 2545r
Kampmeier, C., 2526
Karnatz, H., 2240, 2253
Karner, L., 2626
Kassanis, B., 2853, 2855, 2970
Kato, T., 2667
Kaura, N. R., 3100e
Kazjmin, G. T., 2237
Keane, F. W. L., 2246, 2247
Kearns, H. G. H., 2621d
Keener, P. D., 2642
Kefford, J. F., 3075
Keijer, E. J., 2451
Keitt, G. W., 2545u
Keller, H., 2544
Keller, J. R., 3008
Kemmerer, H. R., 3011l
Kemp, H. K., 2279
Kendrick, J. B., Jr., 2666, 2784
KenKnight, G., 2465
Kenneth, R., 2712
Kennett, C. E., 2490
Kent, R. L., 2555
Kenya Department of Agriculture, 3303

Kesteren, Rijkstuinbouwconsulentschap, 3304
Keyer, E. J., 2545s
Khan, A. H., 2880
Khanduja, S.-D., 3269y
Kick, H., 2135
Kidson, E. B., 2817
Kimball, K., 2372
King, N. J., 3234, 3285
Kirkham, D. S., 2449
Kirkpatrick, H., Jr., 2621k
Kłas, Z., 2171
de Kleermaeker, E., 2733
Klein, S., 2364
Klimenko, V. N., 3100k
Klinkowski, M., 2696
Klostermeyer, E. C., 2651
Klougart, A., 2627, 3011m
Knoppien, P., 2783
Knorr, L. C., 3061, 3100l
Knott, J. E., 2625
Kobel, F., 3286
Koblic, J., 2322i
Kofranek, A. M., 3006
Kohler, K. O., 2639
Kolesnik, L. V., 2376
Kolosov, I. I., 2178
Kos, M., 2208d
Koščeev, A. K., 2668
Košelenko, V. M., 2241
Kosugi, K., 2961
Kramer, A., 2134
Krause, W. G. C., 2395g
Kretschmer, A. E., 2146
Krickl, M., 2764
Krimgold, D. B., 2198
Krishnamurthi, S., 2834, 2838m
Krochmal, A., 2868
Krokan, O., 2395h
Krone, P. R., 2949
Kronenberg, H. G., 2395i
Krylov, M. M., 2315
Kudašev, I. S., 2912
Kummer, H., 2633
Kurmies, B., 2208n
Küthe, K., 2539
Kux, M., 2742

La Follette, J. R., 3031
Laibach, F., 2165
Lakon, G., 3011n
Lalatta, F., 2274, 2288
Lamb, J., 3247, 3249, 3269z
Lambeth, V. N., 2638, 2778
Landrau, P., Jr., 3231
Langhans, R. W., 2927
Laoh, J. P., 2164
Lapins, K., 2246, 2247
Large, J. R., 2532
Lathrop, E. C., 2321
Lathrop, F. H., 2705
Lauden, L. L., 3233
Laue, G., 2545t
Lauenstein, A., 2159, 2418
Lauffer, M. A., 3323n
de Laveleye, Y., 2606
Lavy, J., 2511
Lawalrée, A., 3323j
Lawrence, E. N., 2194
Lawrence, N. L., 2695
Lawrence, W. J. C., 2166, 2796
Learner, E. N., 2802
Leben, C., 2545u, 2821
LeBlanc, R. J., 3270a
LeClerg, E. L., 2838n
LeCompte, S. B., Jr., 2602, 2603, 2619
Lecomte, R., 2208s
Lecrenier, A., 2269
Lee, R. E., 3011o, 3011p
Leonard, C. D., 3100s
Leonard, O. A., 2621e
Leopold, A. C., 2157
LeRoux, E. J., 2670
Lesley, M. M., 2952
Lewis, F. H., 2457, 2545a
(Limasset, P.), 2960
Lime, B. J., 3100i
Lindsay, W. L., 2147
Link, C. B., 3000
(Linz, E.), 2930
Lipp, L. F., 2925
Littauer, F., 3054
Little, H. B., 2924
Little, L. D., Jr., 2946
Litzenberger, S. C., 2910
Liverman, J. L., 2160
Ljones, B., 2270, 2271, 2339, 2411
Locsin, C. L., 3205
Locsin, M. V., 3209
Loegering, W. Q., 2893
Loeters, J. W. J., 2842
Loewel, E. L., 2278
Logcher, C., 2208t
Logothetis, C., 3087
López, H. R., 2893
Lopez, M. E., 3235
López-Matos, L., 3185
Lordello, L. G. E., 3100m, 3150
Louvrier, —., 3077
Luc, M., 3178
Lunin, J., 3212, 3215
Luque, J. A., 2377
Lusis, E., 2438
Lytkin, I. A., 2887

M., A., 2208u
M., S., 2838o
Maatsch, R., 2959
Macaulay Institute for Soil Research, Aberdeen, 3305
McCauley, B. G., 2322j
McClung, A. C., 2408
McCollum, G. D., 2774
McCormack, T. H., 2869
McCready, R. M., 3076
MacDaniels, L. H., 3011q
McDonald's Corner Dominion Horticultural Substation, New Brunswick, 3306
McEacharn, N., 3323k
McGlasson, W. B., 2319
McIlroy, R. J., 3254
McKeen, C. D., 2835
McKinney, R. S., 3098, 3099
(MacLean, A.), 3230
McLean, D. M., 2838p
MacLean, J. A. R., 3137
McLeish, J., 2632
MacPhee, A. W., 2520
McQuade, H. A., 2947
McTaggart, N. G., 2322a
Mader, H., 2208v
Mahmoud, S. E. M., 3071
Maines, W. W., 2653
Majewska, W., 2810
Majewski, F., 2810
Malan, H., 2384
Malavolta, E., 2629
Malcolm, D. G., 2200
Mameli-Calvino, E., 2923
Manaresi, A., 2322k
Mann, A. J., 2246, 2247
Mann, L. K., 2838q
Mansfeld, R., 2326
Manske, R. H. F., 2876
Manzoni, L., 2476
Marais, J. S., 3314
Maramorosch, K., 2932
Margolis, D., 2276
Marloth, R. H., 3018
Marsano, M., 2395j
Marth, P. C., 2341, 2691
Martin, D., 2312
Martin, E. D., 3011r
Martin, J. P., 3015, 3029
Martin, J. T., 3293
Martins, J. E. D., 3159
Martorell, L. F., 3239, 3240
Martyn, E. J., 2708
Marx, T., 2811
Massee, A. M., 3287
Massey, D. M., 2980
Matinjan, A. B., 2125
Matkin, O. A., 2953
Matthews, W. S. A., 2891
Maunder, A. H., 2126
Maurel, M. A., 2872
Maurié, A., 2375
Mauritius Department of Agriculture, 3307
Mauritius Sugarcane Research Station, 3199, 3270b
Maury, P., 2395e
Maxwell, N. P., 2350
May, W. B., 2208w
Mazzei, A., 2395k
Mazzei Patrone, I., 2545v
Meahl, R. P., 2946
van der Meer, F. A., 2433
van der Meer, H. J., 3255
Mega, K., 2931
Melville, A. R., 3163
Méndez, F., 3206
Menon, K. P. V., 3269m
Menzel, R. G., 3043
Mercuri, S., 2656
Merle, P., 3180
Merrill, S., Jr., 3097
Merwarth, F. L., 2769
Mes, M. G., 2181
Mesa Bernal, D., 3145
Messing, J. H. L., 2940
Metcalf, R. L., 2523
Metlickiĭ, L. V., 3070
Metlickiĭ, Z. A., 2257
Meyers, T., 2395l
Mezzetti, A., 2760, 2838r
Michelbacher, A. E., 2493, 2494
Middleton, J. T., 2784
Miles, H., 2645
Miles, M., 2645
Miličič, D., 2322l
Miljanovskiĭ, E. S., 3100n
Miller, C., 2845
Miller, C. O., 2140
Miller, L. W., 2485
Miller M., R., 3125, 3130
Miller, M. W., 2621f
Miller, P. R., 3011s
Minges, P. A., 2838q
Minić, M., 2546l

Ministry of Agriculture, British Columbia, 2123
Ministry of Agriculture, London, 2208x, 2540, 2545w, 2634, 2934, 3011t
Minz, G., 2647
Mirassou, E., 2598
(Mirrado, J. H. M.), 3299
Missingham, L. J., 3183
Mississippi Agricultural Experiment Station, 3308
Missouri Agricultural Experiment Station, 3309
Mitchell, A. E., 2310, 2450
Mitchell, J. W., 2208z, 2691, 2697
Mitchell, L. C., 2529
Mitchell, W., 2922h
Mitchell, W. G., 2926
Mohammad Ibrahim, P. A., 3143
Mohammad, W., 3216
de Mol van Oud Loosdrecht, W. E., 2967, 2969
Monk, R. J., 2897
Monselise, S. P., 3033
Monteith, J. L., 2191
Montelaro, J., 2809
Montero M., J. M., 3270c
Monzini, A., 2317
Moore, R. C., 2594
Moreau, C., 3073
Moreton, B. D., 2743
Morettini, A., 2275, 3081
Morgan, N. G., 2621d
Morgan, R. R. T., 2209c
Mori, H., 2265
Morris, L. G., 2799
Mortensen, E., 3026
Morton, D., 2891
Moškov, B. S., 2163
Motai, M., 2661, 2777
Mowry, D. T., 2183
Much, K., 2505
Mueller, R. T., 2175
van den Muijzenberg, E. W. B., 2723
Mulder, D., 2401
Mulder, M., 3002
Müller, F. P., 2761
Müller, G., 2500
Müller, H., 2248, 2418
Mullin, R. S., 2207
Müllner, L., 2381, 2395m
Mungomery, R. W., 3285
Munnecke, D. E., 2944
Murakishi, H. H., 3011u
Murawski, H., 2322m
Murneek, A. E., 2444
Murucci, P. E., 2509
Musser, H. B., 2971
Muthuswamy, S., 2922i, 3113
Muzik, T. J., 3186
Myers, A., 2335
Myers, A. T., 3095

Nacentov, D. I., 2672
Nagy, B., 2514
Narayanan, E. S., 2545x, 2838s
Naude, T. J., 3315
Naundorf, G., 3126, 3129, 3130, 3134, 3135
Nauriyal, J. P., 3030
Nautiyal, K. N., 2881
Neal, O. M., 2999
Neff, M. S., 3096
Nel, R. I., 2216
Nesdal, O., 2289
Neubauer, H. F., 2416
Neumann, D., 2916
Neumann, G., 2776
Newburgh, R. W., 2154
Newcomer, E. J., 2486
Newhook, F. J., 2996
Newton, G. K., 3253
Newton, W., 3270d
Nicholas, D. J. D., 2177, 2812, 2813
Nichols, C. W., 2856
Nicholson, J. O., 2236
Nicol, J., 3132
Nicolaisen, N., 2679
Nicolaisen-Scupin, L., 2765
van Niekerk, P. E. le R., 2399
Nielsen, H., 2671
Nietzke, G., 2838t
Nisikado, Y., 2480, 2977
Noll, C. J., 2604, 2607, 2608, 2615
Noothout, A. J., 3270s
Norman, P. A., 3062, 3063
North, C. P., 3034
Norton, J. P., 2208y
Novel, —., 2641
Novikov, N. M., 2669
Nugent, L., 3233
Nutman, F. J., 3139
Nyasaland Protectorate Department of Agriculture, 2848, 3094, 3251, 3310, 3323 l
Nyhlén, Å., 2327

Oberle, G. D., 2236
Oberthür, K., 2857
O'Connor, B. A., 3149
Odland, M. L., 2604, 2607, 2608, 2615
Oganesjan, A. P., 2412
Ogle, W. L., 2134
Okazaki, M., 2395f
Oland, K., 2406
Oldén, E. J., 2322n, 2422
Oldham, F. S., 2382
Ollagnier, M., 3177
Olson, E. O., 3052, 3058
de Ong, E. R., 2614
Ono, T., 2297
Ontario and Canada Departments of Agriculture, 2545y, 2545z
Opitz, K. W., 3032
Opsomer, J. E., 3101
Oratovskiĭ, M. T., 2242
Orellana, R. G., 3131, 3136
Organisation for European Economic Co-operation [OEEC], 2531
Oršanskaja, V. N., 3056
Orsenigo, J. R., 2566
Ortega, J. C., 2515
Osawa, T., 2413
Östlind, N., 2290
Osvald, H., 3282
Otomo, C., 2252
Overcash, J. P., 2395n
Owen, O., 2644, 2940, 2980
Owens, H. S., 3076
Oyaizu, W., 2297
Paclt, J., 2992
Paeschke, J., 2722
Paisley, K., 3011v
Pak, K. H., 2595
Palmer, C. W., 3004
Palmer, J. K., 2867c
Palmira, Campaña Nacional de Cacao, 3320
Palmira Estación Agricola Experimental Colombia, 3311
Palti, J., 2647
Pandittesekera, D. G., 2885
Papo, S., 3084
Parham, B. E. V., 3270e
Parnjakov, V. L., 2747
Parra H., J., 3161
Parsons, C. S., 2804
Pasquier, H., 2657
Paszewski, A., 2675
Patel, G. I., 2395t
Paterson, D. R., 2754
Patterson, J. B. E., 2546a
Paur, S., 2868
Payette, A., 2468
Pearson, C. M. O., 3270f
Pearson, J. A., 2311
Pease, R. W., 2395o
(Pedersen, K.), 3276
Peiris, J. W. L., 2837, 3270d
Peleg, J., 3084
Pelletier, E. N., 2459
Penman, F., 2382
Penningsfeld, F., 2185
Pennsylvania Agricultural Experiment Station, 3323m
Pennsylvania College of Agriculture, 2546b
Pepper, B. B., 2831
Perco, E., 2395p
Perkins, D. Y., 2616
Perrot, A., 2545e
Petersen, A. W., 2671
Petersen, V. J., 2671
Peterson, C. E., 2752
Petrosini, G., 2844
Petrović, N., 2546 l
Peyer, E., 2395q, 2534
Peynado, A., 3038, 3039
Peynaud, E., 2375
Philp, J., 2599
Phipers, R. F., 2922c
Picard, J., 2681
Picco, D., 2473
Pienaar, W. J., 2399
Pillsbury, A. F., 2197
Piñero, M., 3228
Pirovano, A., 2345
Plá, J. L., 3167
Plakidas, A. G., 2991, 3011b
Plate, H.-P., 2496
Plummer, B. E., Jr., 2517
Poggi, G., 2395r
Pogliaga, H. H., 2867a
Pogorleckiĭ, B. K., 2945
Polania Trujillo, H., 3270g
Polhemus, D. N., 2193
Poljakoff-Mayber, A., 2173, 2775
Ponniah, L., 3011w
Portolés Alonso, A., 2888
Portsmouth, G. B., 3248
Postlethwaite, J. D., 2799
Potter, C., 2703

Praloran, J. C., 2281
Pratolongo, U., 2344
Pratt, H. K., 2141
du Preez, D., 3092
van Prehn, E., 3160
Preston, W. H., Jr., 2208z, 2691, 2697
Preusker, H., 2838u
Prevot, P., 3177
Pridham, A. M. S., 2584, 2981, 2998, 3005
Primault, B., 2417, 2426
Princi, F., 2546c
Proctor, C., 2824
Proctor, J. M., 2617
Prokofjev, S. D., 2340
Pryor, M. R., 2568
Puccini, G., 2936
Pulselli, A., 3081
Pupillo, M., 2482, 3085
Purewal, S. S., 2870
Purvis, E. R., 2266
Puttarudraiah, M., 3270h
Puzzilli, M., 2843, 2846
Py, C., 3182

van Raalte, D., 2958
Radhakrishna Rao, K., 3113
de Rafols, W., 2903
Rahn, E. M., 2595, 2596, 2610, 2692
Rai, G. S., 2206, 2621g
Rajagopalan, S., 2878
Rajasekhara Mudaliar, C., 3011x
Ramakrishnan, V., 3011x
Ramanath, S., 3270i
Ramasomayajulu, M. V., 2325
Ramasomayazulu, M. V., 3171
Rämsch, H., 2621h
Ramsfjell, T., 2400
Raphael, T. D., 2801
Rappaport, J., 2172
Rasmussen, C. L., 2630
Rasmussen, C. R., 2717
Rasmussen, W. B., 2651
Raucourt, M., 2521
Raymond, W. D., 2894
Rebour, H., 2121
Rebstock, T. L., 2149
Reed, J. P., 2831
Reekers, I., 2136
Reeve, R. M., 2328
Reeve, W., 2208z
Refsdal, K., 2411
Rehbein, C. A., 3232
Rehm, S., 2767
Reichart, G., 2508
Reimer, C A., 2343
Reinhold, J., 2786
Reinmuth, H., 2431
Reitz, H. J., 3049
Remmert, L. F., 2695
Rempe, H., 2731, 2742
Remy, P., 2256
Renaud, M., 2298
Research Council of Israel, 3288
Ricasoli, B., 2353
Rice, C. E., 2867b
Richards, R. R., 2801
Richardson, F. N., 2896
Richardson, S. D., 2988
(Richter, H.), 2429
Riehl, L. A., 3100o
Riepma, P., 2621i
Ries, S. K., 2600, 2609, 2611, 2612, 2618
Rieuf, P., 2816
Rittershausen, P. R. C., 3289
Rivoire, P., 2333
R[oberts], E. A. H., 3270j
Roberts, F. M., 3139
Roberts, R. H., 2299
Robertson, M., 2334
Robertson, R. N., 2311
Robinson, E., 2145
Robinson, J. B. D., 3217
Robinson, P., 2189
Robinson, W. B., 2371
Roby, F., 2234
Rochecouste, E., 2548
Roesler, R., 2488
Rogers, B. L., 2285, 2403
Rogers, W. S., 2423
Roland, G., 2772
Roll-Hansen, J., 2788
Romanovič, E. A., 2794
Rosenthal, C., 2883
Ross, E., 2524
Röszler, P., 2929
Rousset, P., 2511
Rowley, G. D., 2978
Roy, R. S., 3172
Rubber Research Institute of Malaya, 3187, 3189, 3194
Rudolph, E. D., 2918
Rui, D., 3086
Runger, W., 2959
Russell, R. C., 2565

Sacantanis, K. B., 3088
Sackston, W. E., 2922j
Sahm, U., 2811
Sakamoto, K., 2265
Sakanishi, Y., 2931
Salter, P. J., 2814
Sambasiva Rao, I. K., 3264
Samuels, G., 3270k
Samuels, J. K., 2395l
Sanford, K. H., 2520
Santucci, F., 2862
Sarasola, A. A., 3083
Sardone, L. T., 3270l
S[armah], K. C., 3258, 3261, 3262, 3269j
Sasimir, J., 2208r
Sato, K., 2484
Satyabalan, K., 3144
Satyanarayana, M. C., 3155
Satyanarayana, P., 2527
Saunders, A. R., 3316
Savage, E. F., 2461
Savvides, K., 3048
Sax, K., 2244
Scarchuk, J., 2838v
Ščepotjev, F. L., 2393, 2394
Schanderl, H., 2409
Schellenberg, A., 2425
Schmidt, G. J., 2783
Schmidt, N. O., 3220
Schneble, K., 2185
Schneider, F., 2546d
Schneider, H., 3050, 3051
von Schöning, R., 2546e
Schopp, R., 2706
Schread, J. C., 2942
Schroo, H., 3218, 3220
Schwarzenbach, H., 2356
Schweers, V. H., 2570
Schweiger, H., 2983
Schwerdtfeger, F., 2546f
Sciaroni, R. H., 2581, 2941, 3006
Scoresby Horticultural Research Station, 2215
Scott, D. H., 2341, 2469
Scott, L. E., 2635
Scott, R. A., 2390
Scott, W. W., 2919
Scrivani, P., 3055
Scurti, J., 2322c
Sedláček, J., 2322o
Seeley, J. G., 2989
Seifter, E., 2144
Seilleur, P., 2208s
Sell, H. M., 2149, 2209b
Sequeira, L., 2151
Serena, G., 2360
Serr, E. F., 2391
Seshadri, T. R., 3011w
Sethi, W. R., 3141
Shah, S. M. I., 2124, 3204
Shanks, J. B., 3000, 3008
Sharma, M. K., 2243
Sharma, P. C., 2674
Sharpe, R. H., 2387
Shaulis, N., 2371, 2372
Shaulis, N. J., 2369
Shaw, E., 3043
Shaw, R. H., 2793
Shaw, W. L., 2630
Shay, J. R., 2233, 2545f, 2545p
Shear, C. B., 3095
Shepherd, J. L., 2867b
Sherman, M., 2704
Shichijo, T., 2484
Shirley, R. L., 2302
Shmueli, E., 2805, 3116
Shull, A. V., 3038
Sick, E., 2477, 2478
Siddappa, G. S., 3046
Siev, D., 2805
Sievers, E., 2838w
Sigel, E. M., 2713
Silberschmidt, K., 2987
Silva, E., 3228
Silvy, A., 3182
Simkover, H. G., 2546g
Simmonds, F. J., 3270m
Simmonds, N. W., 3110, 3111, 3269t, 3270n
Simmons, J. A., 2585, 2586
Simons, R. K., 2273
Sinclair, W. B., 3100p
Sinden, J. W., 2713, 2730, 2732, 2739
Singh, L. B., 3030, 3266
Singh, L. P., 3267
Singh, M. P., 3040
Singh, R. N., 3173
Singh, S. N., 2243
Singleton, K. G., 2922c
(Singleton, W. S.), 2904
Sironval, C., 2337
Sites, J. W., 3049
Sivec, S., 2882
Skellam, J. G., 2133
Skepper, A. H., 3017
Skolko, A. J., 2698
Skoog, F., 2845
Škropin, P., 2322o

Sleeth, B., 3052, 3057, 3067, 3100q
Šmargonj, E. N., 2913
Smith, A. M., 3290
Smith, B. C., 2997
Smith, C. L., 2386
Smith, F. F., 3011d
Smith, J. D., 2975, 2976
Smith, K. M., 3323n
Smith, N. M., 3229
Smith, O., 2566
Smith, P. G., 2624
Smith, P. M., 2703
Smith, R. J., 3100r
Smock, R. M., 2223
Snapp, O. I., 2546h
Snethlage, P., 3108
Snyder, E., 2365
Société Pomologique de France, 3319
Solari, M., 2720
Solaroli, V., 2453, 2492
Solovjeva, M. A., 2322p
Sörgel, G., 2700
South Australia, Botanic Garden, Adelaide, 3323o
Southern Rhodesia Tobacco Research Board, 2841
Spencer, H., 3062, 3063
Spencer, R. T., 2838x
Spijkman, L., 2208t
Špilenja, S. E., 2874
Spina, P., 2684
Spoelstra, P. A., 2725
Sprenger, A. M., 2254
Sprinks, F. O., 3252
Sproston, T., Jr., 2919
Squires, J. A., 2894
Stafford, E. M., 2503
(Stahl, C.), 3323d
Stanton, D. J., 2817
Stapp, C., 2546i
Stark, E. W., 2395s
Starnes, O., 2831
Statens Forsøgsvirksomhed i Plantekultur, 2501, 2546j, 2790
Statens Plantepatologiske Forsøg, 2396
Steeves, T. A., 2151
Steiner, M., 2889
Steingruber, P., 2381
Stellwaag, F., 2438
Stephens, R., 2564
Stephens, T. S., 3100i
Sterling, C., 3009
Steward, F. C., 2142
Stewart, I., 3100s
Stinson, F. A., 2841
Stinson, R. F., 2943
Stirnberg, A., 2208c
Stitt, L. L., 2498
Stoller, B. B., 2714
Stolp, D. W., 2209a
Stone, H. M., 2825
Stone, M. W., 2650
Storey, I. F., 2699
Storey, W. B., 3269u
Story, G. C., 3202
Stoutemyer, V. T., 2169, 2972
Strain, H. H., 2139
Stritzke, S., 2392
Stromberg, V. L., 2877
Strydom, E., 2631
Stuart, N. W., 2968
Stucky, A., 2314
Suárez de Castro, F., 3158
Subba Rao, A., 3270o
Subramanian, C. K., 3100t
Subramanian, D., 2834, 2838m
Sudan, Ministry of Agriculture, Research Division, 3312
Suit, R. F., 3016
Sullivan, D. T., 2306
Sundqvist, S., 2785
Šutić, D., 2827
Suzuki, K., 2297
Swanson, C. A., 2176
Sweet, R. D., 2600, 2609, 2611, 2612, 2618
Syamal, N. B., 2395t
Szalay-Marzsó, L., 2508

T., H., 3270p
Tai, E. A., 3013, 3020
Tamashiro, M., 2704
Taniuchi, T., 2640
Tarragan, M., 2806
Tasmanian Department of Agriculture, 2951
Taylor, E. H., 2197
Taylor, O. C., 2310, 3100a
Teague, C. P., 3031
Templa, M. A., 3270q
Tenembaum, J. L., 2905
Terra, G. J. A., 3107
Teubner, F. G., Jr., 2296
Tewfik, S., 2635
Thiele, V. K., 2418
Thimann, K. V., 2578
Thomas, H. E., 2324, 2436
Thomas, L. A., 2249
Thomas, W. D., Jr., 2937
Thomas, W. D. E., 2177, 2812, 2813
Thompson, A. H., 2286
Thompson, H. A., 3224
Thompson, W. L., 3061
(Thompson, W. R.), 2545d
Thorne, D. W., 2147
Thorne, G. N., 2636
Ticó Roig, L., 2906
Tindale, G. B., 2320
Tinley, J. M., 3100r
Tkačenko, F. A., 2677, 2838y
Tkačenko, G. V., 2370
Togliani, F., 2402
du Toit, J. L., 3210
Tollenaar, D., 3270r
Tomažič, G., 2882
Tombesi, L., 2849
Tomkins, J. P., 2372
Tomkins, R. G., 2322q
Torgeson, D. C., 2995
Torres, F. G., 2902
Toth, S. J., 2146
Treccani, C. P., 2318
Trickett, E. S., 2536
T[rinick], J. M., 3270j
Trinidad and Tobago Director of Agriculture, 3313
Truog, E., 2208h
Trzcinski, T., 2269
Tsukamoto, Y., 2931
Tubbs, F. R., 2590
Tupikov, M. A., 2395u
Turian, G., 2479
Turković, Z., 2395v
Twyman, R. C., 2838z

Unger, K., 2700
U.S. Department of Agriculture, 2122, 2397, 2654, 2861, 3200, 3291
Usik, G. E., 2669
Usman, S., 3270h

Valat, C., 2354
Valleau, W. D., 2557
Valsechi, O., 2911
VanLeeuven, E. R., 2533
Varadarajan, B. S., 3100t
Varney, E. H., 2458
Vaščenko, S. F., 2672
Vasiljev, A. V., 2928
Vaughan, E. K., 2839c
Veerman, W., 2502
van der Ven, L. F. J. M., 2842
Venjjaminov, A. N., 2238
Venkataramani, K. S., 2746
Venkataratnam, L., 3105
Venugopal, S., 3140
Verona, O., 3292
Vervloet, C., 3270s
Vettori, M., 2374
Vibstad, A., 2788
Vickery, H. B., 2867c
Viel, G., 2521, 2522
Viets, F. G., Jr., 2693, 2694
(Vines and Wine, Seventh International Congress), 2346
Viney, R., 2120
Vink, A. P. A., 3193
Virelizier, P., 2908
Visser, T., 2263
Vituškina, I. V., 3100u
Vodopivec, S., 2882
Vorževa, L. V., 2221
Vouk, V., 2208d
Vreeken, C. N., Sr., 2839a
van de Vrie, M., 2546k
Vučenović, A., 2546l
Vuittenez, A., 2439

van der Waal, M. A., 2783
Wagener, W. W., 2448
Wahl, I., 2712
Walker, E. A., 2563, 2620
Wallace, A., 2175, 2186, 3034
Wallace, J. G., 2839b
Wallace, J. M., 3051
Wallace, T., 3293
Wallen, V. R., 2698
Wallin, J. R., 2193
Wang, M. Y., 2188
Ward, J., 2922k
Ward, J. B., 2894
Warington, K., 2138
Watanabe, H., 2686
Watanabe, K., 2480, 2977
Waterhouse, A. D., 3222
Watson, D. P., 2745
Way, M. J., 2703, 3146, 3147
Waywell, C. G., 2576, 2588
Weathers, L. G., 3053
Weaver, R. J., 2379
Webber, E. R., 2205, 2828
Weber, P. V. V., 2769
Wedding, R. T., 3047
Weger, N., 2800
Wehunt, R. L., 2266

Weinhausen, K., 3271
Weissenborn, K., 2292
Welch, H. V., Jr., 2175
Welch, J. E., 2624, 2773
Welch, J. F., 2546m
Wellensiek, S. J., 2933
Weller, L. E., 2209b
Wene, G. P., 2655, 2709, 2836
Wesley, R., 2551
West African Institute for Oil Palm Research, 3174, 3175
West of Scotland Agricultural College, 3317
Westenberg, M. G., 3188
Westlake, W. E., 2542
Weydahl, E., 2751
Whitaker, T. W., 2774
Whitehead, S. S., 2621j
Whitney, J. B., Jr., 2176
Wiebe, J., 2808
Wiegand, K., 2186
Wiersum, L. K., 3190
Wiggins, L. F., 3270c
Wight, W., 3243
Wilhelm, A. F., 2546n
Wilhelm, S., 2324, 2941
William, A., 2737
Williams, A. E., 2383
Williams, B. C., 2179
Williams, C. G., 3091, 3184
Williams, J. R., 3237
Williams, T. R., 2209c
Williams, W. T., 2674
Willis, A. J., 2161
Wilson, T. B., 3226
Wilson Jones, K., 2572
Winslow, M. M., 3012, 3100v, 3100w
Winter, H. F., 2446
Winters, H. F., 3268
Wishart, R. L., 2820
Witte, K., 3294
Wittwer, S. H., 2209b, 2754, 2939
Wohlmuth, N., 2208p
Wolf, D. E., 2558
Wolfe, H. R., 2432
Wood, C. A., 2334
W[ood], D. J., 3270j
Woodford, E. K., 2561
Woodroof, J. G., 2388
Woodward, H. C., 2313
Worley, D. P., 2577
Wurgler, W., 2291

Yale, J. W., Jr., 2839c
Yamato, M., 2336
Yemm, E. W., 2161
Yeoman, A. H., 2533
Yoder, J. B., 2732
Young, H. C., 2446
Young, P. A., 2818
Younkin, S. G., 2769
Yusuf, N. D., 3216

Zakarija, A., 3089
Zaumeyer, W. J., 2697, 2839d
Zdruíkovskaja, A. I., 2258
Zenker, A., 2165
Zimmerman, P. W., 2621k, 3011y
Zimmermann, J., 2362, 2395w
Živanović, V., 2513
Živojinović, S., 2507
Zobrist, L., 2530
Zohary, M., 2389
Zorin, F. M., 3024
Zoz, I. G., 2873
Zukel, J. W., 2545m
Zuluaga, P. A., 2366

# INDEX

## H.A. Vol. 24. No. 4.

N.B.—Brackets round the name denote that this person, although not the author, was directly or indirectly concerned with the article.

Abad Manrique, J. B., 4009
Abrahão, T., 4337
Adamson, R. M., 3769
Adsuar, J., 3984
Agati, J. A., 3883, 4033
Aggarwal, J. S., 4003b
Ahlers, N. H. E., 4068q
Ahmad, S., 4264a
Akamine, E. K., 4263
Akour, A. A., 4062
de Alba, J., 4446a
Albareda Herrera, J. M., 3778
Alderfer, R. B., 3539a
Alderton, G., 4068a
Alexander, W. P., 4446b
Alfaro, A., 3671
Allard, R. W., 3859, 3955a, 3955b
Allen, H. W., 3650
Allen, M., 3679, 3680
Allen, N., 3996
Allen, P. J., 3604
Allentoff, N., 3523
Allerton, F. W., 4448
Allington, W. B., 3986
Allmendinger, D. F., 3858
Allo, A. V., 3728
Allsopp, A., 3369
Altman, R. F. A., 4006
(Alvim, P. de T.), 4291
Amateur Gardening Handbooks, 4494a
Amy, A. S., 3984
Anandan, A. P., 4314
Andison, H., 4114
Andrade, A. C., 4422
Andrew, W., 3759a
Andrews, F. W., 3759a, 4494b
Andronov, N. M., 4139
Ankinovič, G. B., 3432
Anon., 3329, 3418, 3454, 3509, 3534 3539b, 3674, 3676, 3835, 3877, 4068b, 4072, 4412, 4446c, 4446d
Anthon, E. W., 3597
Antoniani, C., 3782
Antony, J., 4321, 4447c
Aomori Apple Experiment Station, 3539c
Arant, F. S., 4148
Arceneaux, G., 4365
Archibald, J. A., 3510
Armitage, H. M., 4264b
Armstrong, G. M., 4085
Armstrong, J. K., 4085
Armstrong, J. M., 3759b
Arney, S. E., 3547
Arthur, H. R., 4446e
Asai, T., 4068c, 4068d
(Asami, Y.), 3768
Astrego, J. J., 3767
Atcheson, W. C., 4127
Athrey, N. B., 4446f
Atkins, C. D., 4264c, 4264w
Atkins, E. L., Jr., 4229
Atkinson, J. D., 3590, 3594
Atmore, S., 4078
Atomic Energy Research Establishment, 3443a
Auguste, A., 4209
Australia, C.S.I.R.O., 3445, 3517, 3567, 3697, 3718, 3783, 3785, 3909, 3957, 4064, 4467
Åvall, H., 3762
Averell, P. R., 3690h
Avramov, L., 3563
Azoff, M. B., 4013

Bailey, G. F., 4264g
Bain, D. C., 3813
Baker, V. H., 3334
Bakker, M., 3902
Ballot, R., 4206
Balzak, S. S., 4449
Bangdiwala, I. S., 4415
Barak, D., 3496
Barat, M. H., 4340, 4341
Barbados Central Sugar Cane Breeding Station, B.W.I., 4367
Barbados Department of Science and Agriculture, 4461
Barber, A. C., 4450
Barker, B. T. P., 3539d, 4451
Barker, J. S., 3850
Barnes, A. C., 4363
Barnes, M. M., 3651, 3659, 3689a
Barsukov, L. N., 3371
Bartholomew, E. T., 4234
Bartolome, R., 4299
Barton, L. V., 4141
Bashir, C. M., 3951
Batinica, J., 3658
Batjer, L. P., 3495, 3498
Batra, H. N., 3840
Baud, C., 4162a
Bauer, A. H., 3690f
Bavaud, J., 4158
Bawden, F. C., 3810
Bazán de Segura, C., 3575, 3867
Beard, F. A., 4041
Beard, F. H., 4042
Beatty, A. V., 4098
Beatty, J. W., 4098
Beaufils, E. R., 4359
Beaumont, A., 4162b
Becker-Dillingen, H., 3586
van Beekom, C. W. C., 3880
Beijer, J. J., 4119
Bel., 3429
Beljakova, M. B., 3656
Benedict, H. M., 3588
Benson, N. R., 3502
Bentley, J. A., 3443b
Beraha, L., 3796, 3797
Berezowski, B., 3969
Bergann, F., 3335
Bergmann, W., 4068e
Bernardy, P., 4385
Bernstein, L., 3916
Beroza, M., 4053
Bessard, —., 3689b
Bevenue, A., 3931
Bharucha, F. R., 4060
Bhatia, B. S., 4275
Biale, J. B., 3518, 4243
Bielka, R., 3775
(Binfield, R. E.), 3539e
Bingham, F. T., 3402
Biologische Bundesanstalt f. Land-u. Forstwirtschaft, Braunschweig, 4462
Birkett, L. S., 4368, 4377, 4446g, 4446h
Bishop, C. J., 3453
Black, C. J., 3572a
Blackman, G. E., 3379
Blaich, O. P., 4268
Blakeslee, A. F., 4010
Blank, B. B., 3955c
Blasingame, R. U., 4334
Bleidner, W. E., 3703, 3704
Blinks, L. R., 3443c
Blodgett, E. C., 3463
Bloemsma, D., 4144
Blomfield, P. D., 3846
Blondel, L., 4189, 4216
Board, P. W., 4284
Bobb, M. L., 3683
Bohmont, D. W., 3691, 3717, 3738, 3759c
Böhnert, E., 4094
Bokučava, M. A., 4439
Bolle-Jones, E. W., 4360
Bolsunov, I., 4003a
Bonazzi, A., 3997
Bonnet, J. A., 4446i
Bordeleau, R., 3723
Borden, A. D., 3632, 3649
Borget, M., 4325
Boselli, F., 4260
Bosian, —., 4093
Boswell, S. B., 4221
Boswell, V. R., 3955d
Bottger, G. T., 4053
Bottini, E., 3392
Boubals, D., 3623

Boulay, H., 3483
Bould, C., 3555
Bovay, E., 3577
Bovey, R., 3601
Boxall, H. G., 3875
Boyle, J. S., 3689c
Boynton, D., 3411
Bradt, O. A., 3497
Bragg, K. K., 3727
Brandon Dominion Experimental Farm, Manitoba, 4463
Braun, O., 3955e
Brauner, L., 3364
Breece, J. R., 3595
Brenna, H. K., 3955f
Breteau, J., 4265f
Brett, P. G. C., 4370, 4446j
Briand, —., 3473
Bridgmon, G. H., 3956k
Brigham, W. T., 3633
British Honduras Department of Agriculture, 4464
Broadbent, B. M., 4235, 4236
Brodie, A., 3733
Broeshart, H., 4351
Brook, P. J., 3607
Brooks, A. N., 3572b
Brooks, R. M., 4452
Brown, A. H., 3360
Brown, E. S., 4319
Browning, H. A., 3777
Bruinsma, F., 3885
Brun, J., 4280
Brunson, M. H., 3650
Brusca, J. N., 4167, 4169, 4170, 4177, 4178, 4197, 4204
de Bruyn, J. W., 4020
Bry, A., 3482
Bryn Adda Horticultural Demonstration Station, 4479
Buchloh, G., 3488
Buck, C. C., 3700
Buckley, R., 3955g
Budagovskiĭ, V. I., 3465
Budnickaja, E. V., 3889
Buhl, C., 3811
Bukowski, T., 3955h
Bundesanstalt für Qualitätsforschung Geisenheim, 3774, 4471
Burchfield, H. P., 3788
Burden, E. H. W. J., 4062
Burke, J. H., 4182, 4217, 4265c
Burke, O. D., 4076
Bürke, R., 3413
Burle, L., 4288
Burris, R. H., 3395, 3443d
Burström, H., 3366
Butler, C. G., 3491
Buzacott, J. H., 4372, 4446k
Bykov, B. A., 4354
Bykovskaja, I. P., 3977
Byrde, R. J. W., 3613
Byrnside, D. S., Jr., 4381

Čača, A. E., 3995
California Department of Agriculture, 4465
Calvert, A., 3430
Camacho Morales, L. H., 4292
Cambra, M., 3570
Cameron, C., 4368
Canada Department of Agriculture, Fruit and Vegetable Products Research Committee, 4466
Cannon, W. A., 3352
Capó, B. G., 4447m
Capreal, S. H., 4088
Cardona, E., 4303
Carlone, R., 3530
Carlson, A. E., 3706
Carman, G. E., 4232
Carncross, J. W., 3908
Carré, J., 4328
Carstens, M. W., 3856
Carter, J. C., 4162c
Casarini, B., 3868
Casida, J. E., 3689d
Cassidy, P. H., 4264d
Castaño A., J. J., 4342
Casteel, H. W., 3572s
Castillo, B. S., 4033, 4281
Cathey, H. M., 4089, 4111
Catlow, E., 3555
Cederman, J. A., 4264e
Cerrini, U., 3489
Ceruti, A., 3879
Cessac, M., 3789
Chacravarti, A. S., 4426
Chakrabarti, J. K., 4068f
Chakravarti, S. C., 3358, 3719
Challenger, S., 4080
Chamberlain, E. E., 3590, 3594
Chamberlin, F. S., 3994
Chandra, V., 4012
Channa, O. N., 4015
Chao, Y-C., 3686
Chapman, H. D., 3402
Chapman, P. J., 3626
Chapot, H., 4264f
Chardon, F., 4383
Charnot, A., 4220
Charon, —., 4162d
Charpentier, L. J., 4416
Chater, J. P., 4047
Chathukutty Nambiar, M., 4317
Chiapparini, G., 3539k
Chichester, C. O., 3397
Childers, N. F., 4453
Chilean Nitrate Education Bureau, Inc., 3403
Chilton, S. J. P., 3744, 4393, 4405
Chinloy, T., 4397
Chippendale, F., 3998
Choudhri, R. S., 3924
Christ, E. G., 3572c, 3572d
Christiansen, E., 3825
Ciferri, R., 3672
Cilli, L. M., 4256
Clark, B. E., 3841
Clark, R. R., 3554
Cleppa Park Horticulture Demonstration Station, 4479
Cobb, R. D., 3759d
Cochran, L. C., 3593
Cochran, W. G., 3443e
Coleman, R. E., 4373, 4423
Colhoun, J., 3955i
Čolić, M., 3658
Collingwood, C. A., 4046
Collyer, E., 3629
Colthurst, J. P., 3955g
Compagnon, P., 4446l
Congrès Pomologique de France, 3539f
Connell, J. U., 3678
Connell, T. D., 4406
Corbet, H. A., 4454
Cordonnier, R., 3624
Cornelius, J. A., 4068g
Corrales Macedo, A., 3955j
Cory, E. N., 4127
Costa, A. S., 4402
Costantino, G., 3642
Coulter, L. L., 3716
Coutanceau, M., 3446
Coveney, R. D., 4067
Cowgill, W. H., 4329
Cox, J. A., 3572e, 3955k, 3956p
Cox, R. S., 3870
Crafts, A. S., 3698, 3700
Crane, F. L., 3913
Crescimanno, F. G., 4183
Cressman, A. W., 4235, 4236
(Crider, F. J.), 4122
Crnčević, V., 3537
Crofts, F. C., 3847
Crombie, W. M. L., 4099
Cropley, R., 3589, 3600
Crosse, J. E., 3602
Crowe, L. K., 3451
Crowley, N. C., 3955l
Crowther, P. C., 4446m
Cruickshank, D. H., 3443n
Cruickshank, J. A., 3715
Cruz, P. I., 4031
C.S.I.R.O., Australia, 3445, 3517, 3567, 3697, 3718, 3783, 3785, 3909, 3957, 4064, 4467
Cuénod, A., 3347
Cuenot, G., 4192
Cumber, R. A., 4034, 4035, 4036
Curl, A. L., 4264g
Curtis, J. T., 4162e
Cuzin, J., 3968
Czaja, A. T., 3431

Dalberg, L. Y., 3384
Dale, W. T., 3950
Dalrymple, J. L., 3978
Daly, J. M., 3362
Darby, J. F., 3932
Das, B. M., 4068o
Date, W. B., 3521
David, W. A. L., 3901
Davidson, L. G., 4382
Davidson, O. W., 4073
Davidson, R. H., 4095
Davies, D. A., 3423
Davies, G. E., 3486
Davis, C. S., 3637
Davis, D., 3941
Davis, T. A., 4314
Dawe, T. C. R., 3884
Dawson, E. H., 3682
Dawson, R. B., 3759e, 4494a
Day, P. R., 3939
De, R., 4379
Dean, H. A., 4264h
DeCaprio, A., 3633
Deen, O. T., 3864
Deetlefs, J. du T., 4246
Dekker, P., 3330, 3539g
Delanoue, P., 3791, 3839
Delhi, Ontario, Dominion Experimental Station, 3958

Delmas, H.-G., 3789
Delmas, J., 3873
Delphey, C. C., 4176
Denham, G. C., 4428
Dennison, A. C., 4068q
Dermine, A., 3579
Dermine, E., 3457
Deszyck, E. J., 4193, 4215
Detroux, L., 3583
Deuel, H., 3409
Deutschmann, F., 4068h
(Devonshire, C. R.), 3749
Dicker, G. H. L., 3689e
Dickey, R. D., 4117
Diener, V. L., 3955m
Dignadice, P. B., 4403
Dijkman, M. J., 4013
Dimock, A. W., 4091
van Dinther, J. B. M., 3690p
Dios Vidal, R., 3778
Djadjučenko, P. M., 3970
Dlinka, A. D., 3770
Dobelmann, J.-P., 4038
Dobrovsky, T. M., 3817
Domangue, D. A., 3742
Dominica Department of Agriculture, 4494c
Dominick, C. B., 3992
Donadoni, S., 4000
van Doorn, A. M., 3882
Dormal, S., 3681
Doutt, R. L., 4262
Downie, W. A., 4338
Dragaš, M., 3558, 3563
Dragavcev, A. P., 3449
Dried Fruit Processing Committee, 3535
Drouillon, R., 4325
Duain Moore, J., 3689c
(Duarte, O.), 4291
Ducet, G., 3806
Duncan, A. A., 3733
Dunegan, J. C., 3689f
Dürr, H. J. R., 3684
Dutt, N. L., 3743
Dvornikova, Z. V., 3770
Dwarkanath, C. T., 4446x
Dye, D. W., 3664
Dye, M. H., 3664, 3665

East Malling Research Station, 4468
Eaves, C. A., 3522, 3526, 3527
Edge, E. D., 3501, 3525, 3824
Edwards, C. A., 3851
Edwards, C. R., 3759c
Efeĭkin, A. K., 3920
Efford Experimental Horticulture Station, Hants., 4479
Ehrenhardt, H., 3955n
Elant, H., 4264i
Elmore, J. C., 3954
Eloja, A. L., 3746
El-Tomi, A. L., 4264j
Elzenga, G., 4020
Emery, G. A., 4045
Emmert, F. H., 3514
Emond, R. E., 3735
Emparan, P. R., 4056
Endrigkeit, A., 3955o
Epling, C., 4162n
Erickson, L. C., 3725
Ernst, E., 3795
Eschenwald, A., 4334
Esteves-de-sousa, A., 4128
Eteneau, J., 4211
European Plant Protection Organization [EPPO], 3689g, 3689h, 4494d
Evans, C. D., 3765
Evers, E., 4358, 4446n
Evesque, J. M., 3572j
Evreinoff, V.-A., 3572f
Eyring, H., 3361

Faccioli, F., 3494
Fairfield Experimental Horticulture Station, 4479
Falk, K., 4132, 4133
Fanshawe, D. B., 4014
Fardy, A., 3968
Farmer, A., 3472
Farrar, R. F., 4040
Faust, J., 3689i
Favre, C., 3577
Federer, W. T., 3344
Federico, L., 3782
Fedotova, A. L., 3955p
Fehleisen, S., 4131
Feigin, Ya. G., 4449
Felber, G. W., 3564
Ferguson, W., 3755, 3759f
Ferraz, M. de B., 4335
Ferrer, L. G., 3972
Ferwerda, J. D., 4352
(Feuell, A. J.), 4050
Fiero, G. W., 3675
Finney, D. J., 3345
Fischer, C. W., Jr., 4162w
Fischer, M., 3653
Fisher, D. E., 3940
Fisher, D. V., 3501, 3519, 3525, 3539h, 3824
Fisher, E. E., 3618
Fiskel, J. G. A., 3927
Fleschner, C. A., 4264k, 4264 l
Flock, R. A., 3659
Foley, F. B., 3871
da Fonseca, J. C., 4227
Food and Agriculture Organization of the United Nations [FAO], 3573, 4469, 4470
Forbes, A. G., 3689a
Ford, H. W., 4186, 4202
Forestry Commission, 3689j
Forsberg, J. L., 4107
Forsee, W. T., Jr., 3925, 3927
Fouarge, E., 4075
Foucart, G., 4051, 4310
Francesconi, F., 4264m
Franck, J.-P., 4290
Franklin, D. F., 3955w
Fransen, J. J., 3818
Franssen, C. J. H., 3853, 3854
Franz, J., 3689k
Frappa, C., 4311
Freed, V. H., 3694, 3759g
Freeport Sulphur Company, 4455
Frémond, Y., 4312
Frenkel, A. W., 3360
Fritz, D., 3917
Fritzsche, R., 3581
Frohner, W., 3713
Frylink, A., 4116
Fujii, T., 3955q
Fukuto, T. R., 3685, 3689x
Fulling, E. H., 4068i
Fullmer, F. S., 4195
Fulton, R. E., Jr., 4244
Funk, G. L., 3707
Furneaux, B. S., 3443f

Gac, A., 3569
Gaden, E. L., Jr., 4249
Gallatin, M. H., 4166
Gallo, D., 4414
Galston, A. W., 3384
Galzy, P., 3572j
Gambrell, F. L., 3641
Gambrill, R. G., 3628, 3689v
Gammon, C., 3651
Gammon, E. T., 4147
Gammon, N., Jr., 3807
Gangolly, S. R., 4317
Garangeat, S., 4264n
Garayar M., H., 4196
García Becerra, C., 4287, 4293
Garcia, G. M., 3883
Garcia Mendez, J. B., 4364
Gardener, J., 3759h
Gardiner, B. O. C., 3901
Garman, P., 3631, 3633, 3669, 3670
Garmus, R. D., 3659
Garner, R. J., 3462, 3478
Gartenbauwissenschaft, 4492
Gäumann, E., 3410
Gaur, B. K., 3924
Gavrilović, M., 3580
Gayford, G. W., 3469
Gedeon, J., 4068j
Gedroyć, H., 3740
Geisenheim, *see also* Bundesanstalt, 3774, 4471
Geissler, G., 3373
Geissler, T., 3828
Gelin, O. E. V., 3842
Geloso, A., 3878
Geoffrion, J.-M., 4086
Georghiou, G. P., 4231
Georgia Experiment Station, 4494e
Geraldson, C. M., 3823, 4106
Gerhardt, P. D., 3661, 4228
Gibson, H. V., 4121
Gillespie, H. L., 4165
Gilmer, R. M., 3599
Gilpin, G. L., 3682
Giovannini, E., 3406
Gjems, O., 3443g
Gleisberg, W., 4007, 4492
Godoy, C., Jr., 4344
Gokhale, N. G., 4427
Golden, A. M., 4146
Goldweber, S., 4214
Golodriga, P. Ja., 3559
Gomes, F. P., 3346
Gómez Alvarez, F. 4387
Gómez, S. A., 4068k
Gondo, M., 3983
González-Mendoza, R., 4345
Gonzalez Rios, P., 4446o
Goode, J. E., 3443h
Goodman, O., 3890
Goodwin, R. H., 3443i
Gordon, S. A., 3378
Gorjačeva, E. P., 3656
Govaert, F., 4048
Govi, G., 3616

Govindachari, T. R., 4446p
Gow, P. L., 4276
Graham, B. F., Jr., 3398
Graham, S. O., 3463
Graham, T. W., 3991
Graner, E. A., 4326
Granhall, I., 3452
Graniti, A., 4257
Granits, J., 3937
Grant, P. J., 4160
Grant, T. J., 4223
Gray, S. G., 4063
Greathead, A. S., 3790
de Greeff, H. J., 4289
Green, H. B., 3634
Green, K. R., 3693, 3759h
Green, M. E., 3809
Greenham, D. W. P., 3739
Gregory, F. G., 3443j
Grène, G., 3721
Grierson, W., 4242
Griesel, W. O., 4154
Griffin, J. F., Jr., 4162f
Griffiths, J. T., 4219
Grigorovič, A. F., 3814
Grindley, D. N., 4062
Grindrod, J., 3532
Grison, P., 3667
Groszmann, H. M., 4004
Grubb, N. H., 3544
Grütz, W., 3780, 3906, 3907
Guagliumi, P., 4418, 4421
Guenther, E., 4022
Guernsey, F. S., 3845
Guillot, R., 3572g
Gurlev, A. S., 3830
Guščin, M. F., 3490
Guseva, A. R., 4055
Guthrie, F. E., 3993

Haarer, A. E., 4027, 4446q, 4446r
van Haarlem, J. R., 3511, 3538
Haas, A. R. C., 4167, 4169, 4170, 4177, 4178, 4197, 4204
Haber, E. S., 3343
Habran, R., 3550
Haenel, H., 3828
Hagedorn, D. J., 3843, 3848
Hahn, E., 3646
Haiek, I., 4441
Hall, E. G., 4245
Haller, M. H., 3615
Hallock, H. C., 3864
Hallowell, C. K., 4123
Halma, F. F., 4164, 4173, 4175
Hamilton, R. A., 4253, 4264o, 4265a, 4353
Hamlyn, B. M. G., 3810
Hance, F. E., 3759i
Hanchey, R. H., 3572e
Handa, K. L., 4015
Hänsell, H., 3955r
Hansen, E., 3521
Hanson, J. B., 3910
Hardcastle, W. S., 3744
Hardenburg, R. E., 3819
Hargreaves, D. B., 4121
Harkness, B., 4162g
Harrington, J. F., 3893
Harris, C. D., 4449
Harris, R. V., 4068 l
Harrison, R. A., 3884
Harrison, T. B., 3673
Harry, J. B., 3708
Hartman-Dröge, C., 4102
Hartree, E. F., 3443 l
Hartzell, A., 3788
Haskell, T., 4142
Hassan, H. H., 3914
Hatcher, E. S. J., 3462
Haude, W., 3443k
Hauser, E. W., 3722
Haviland, E. E., 4127
Havord, G., 4295
Haworth, F., 3776
Haynes, H. L., 3627
Hayslip, N. C., 3925
Hayter, C. N., 3955s
(Healy, M. J.), 4050
Hébert, J. B., 4271
Hein, A., 3689 l
Heinze, P. H., 3368, 3915
Hellyer, A. G. L., 4456
Helmkamp, G. K., 3689m
Hengl, R., 3562
Henriksen, A., 3825
Herbert, L. P., 4389
Herre, H., 4161
Hesse, C. O., 4452
van Heusden, W. C., 4272
Hewitt, E. J., 3401, 3806, 3929
Hewitt, W. B., 3689n, 3689o
Hey, G. L., 3620
Hicock, H. W., 3442
Hield, H. Z., 4264z
Highkin, H. R., 3910
Hildebrand, E. M., 3596, 3689p
Hildebrandt, A. C., 3374
Hildebrandt, H. J., 3775
Hilkenbäumer, F., 3479, 3488
Hill, H., 3528
Hill, R., 3443 l
Hills, O. A., 3836
Hitchcock, A. E., 3710
Hoare, E. R., 3425, 3443m
Hochhausen, I., 4021
Hodgson, J. M., 3759j
Hofer, A. W., 3841, 3955t
Hogsett, J. N., 3707
Holloman, A. J., 3588
Holloway, J. K., 3726
Homeyer, P. G., 3343
Hontoy, J., 4065
van Hoof, H. A., 3812
Hopp, H., 3339
Hopp, R., 3793
Horner, C. E. 4024
Hornstein, I., 3689q
Horsfall, J. G , 3690o
Horst, — , 3436
Hosticka, H. E., 3729
(Hotchkiss, J. C.), 3327
Housley, S. 3443b
Howat, G. R., 4306
Howland, A. F., 3956o
Hoy, J. M., 3736
Hozumi, K., 3955u
Hu, C. C., 4184
Huberty, M. R., 4191
Hughes, C. G., 4399, 4404
Hui, W. H., 4446e
Hulme, A. C., 3520
Humphries, E. C., 3982
Hunnam, D., 3620
Hunter, J. A., 3590, 3594
Hunter, J. G., 3999
Hutchinson, P. B., 4401
Huxley, A. J., 4494a
Hyder, D. N., 3737

Iba, S., 3639
Ilić, B., 3955v
Iljin, W. S., 3400
Imazu, T., 3876
(Indian Tea Association), 4446s
I.N.E.A.C. (Institut National pour l'Étude Agronomique du Congo Belge), 3328, 4358
Inforzato, R., 4332
Ingram, J. W., 4416
Innes, R. F., 4374, 4397, 4446t
Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen, 4472
Intengan, C. L., 3781
I.R.S.I.A. (Institut pour l'encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture, Belgique), 4473
Isaac, I., 3944
Ishigaki, K., 4437
Isherwood, F. A., 3443n
Islip H. T., 4067, 4248
Israel Ministry of Commerce and Industry, 4181
Istas, J. R., 4065
Istituto Regionale della Vite e del Vino, Palermo, 3556
Istituto Scientifico Sperimentale per i Tabacchi, Rome, 3960
Ito, H., 3798
Ivanoff, C., 4016, 4017
Ivanoff, D., 4016, 4017, 4018, 4019, 4026
Ivanoff, S. S., 3833
Ivanoff, T., 4018

Jacks, H., 3607, 3881, 3884, 3933
Jackson, H., 3820
Jackson, W. T., 3979
Jacob, W. C., 3340
Jacyna, A. S., 3484
Jagendorf, A. T., 3443o
Jaggi, E., 3443p
James, W. O., 3443q, 3443r
Jameson, J. D., 4277, 4338
Janaki Ammal, E. K., 4162h
Janes, B. E., 3773
Janke, A., 3937
Jaramillo A., R., 4298
Jary, C. L., 4041, 4047
Jasmin, J.-J., 3755, 3759f, 3763
Jayaraman, V., 4430
Jeener, R., 3981
Jenkins, P. T., 3618
Jenkins, W. R., 4134
Jensen, D. D., 3689r
Jeppson, L. R., 4233
Johansson, E., 3470, 3471
Johar, D. S., 4442, 4446x
John, C. A., 3826
Johnson, E. M., 3989
Johnson, R I , 3792
Johnson, R M., 4350
Johnston, F. B., 3523, 3524
Jones, C. B., 3443s

Jones, G. B., 3389
Jones, G. D. G., 3678
Jones, H. A., 3955w
Jones, K. W., 3759o
Jones, L. S., 3598
Joseph, T. C., 4081
Joshi, G. V., 4060
Joubert, T. G. la G., 3861
Jouve, R., 3499
Junges, W., 3795

Kabi, T., 4071
Kačan, S. S., 3837
Kadam, B. S., 3971
Kahn, R. P., 3863
Kaindl, K., 3412
Kallauch, W., 4162i
Kaloostian, G. H., 3689s
Kanazawa, J., 4438
Kapadia, V. H., 4003b
Kapoor, L. D., 4015
Kassanis, B., 3982, 4083, 4084
Kaudy, J C , 4203
Kawai, S , 4437
Kazjmin, G. T., 3481
Keegel, E. L., 4429
Keep, E., 3478
Keirstead, L. G., 3669
Keitt, G. W., 3599, 3689c, 3690j
Kelbert, D. G. A., 3955x
Keller, J. R., 4090, 4156
Kelsheimer, E. G., 4124, 4162j
Kennett, B. H., 3689t
Kent, W. G., 3539i
Kenya Coffee Board, 4446u
Kerr, E. A., 3918
Kerssen, M. C., 3818
Kester, D. E., 3461
Keuls, M., 4020
Khan, M., 4264a
Khanna, K. L., 4426
Kick, H., 3386
Kind, W., 3443t
King, K. M., 3900
Kirby, A. H. M., 3628, 3689u, 3689v
Kirby, R. S., 4076
Kirk, E. B., 4096
Kirschner, R., 3713
Kitzke, E. D., 4068x
Klenk, —., 3689w
Kljajić, R., 4008
Klotz, L. J., 4247
van de Knaap, W. P., 4294, 4300
Kobel, F., 3552
Koch, E. C., 3632
Koch, E. J., 3342
de Kock, P. C., 3404
Koelle, G., 3965
Koert, J. L., 3880, 3882
Kohli, J. D., 4068t
Kohoutová, Z., 4068m
König, F., 3572h
Koronéos, J. A., 4259
Kothiyal, M. D., 4447h
Kozlova, V. I., 4222
Kozlovskiĭ, V. S., 3516
Kozlowski, T. T., 3860
Kramer, P. J., 3979
Kreibohm de la Vega, G. A., 4396
Kriel, H. T., 4246
Kristensen, R., 4457
Kristoffersen, T., 4136
Krotkov, G., 3976, 4003e
Krüssmann, G., 4162k, 4458
Krylov, D. N., 3484
Kuitert, L. C., 4152
Kuperberg, J., 4346
Kuppuswamy, B. S., 3542
Kuznecov, M. D., 3460
Kyriafinis, B., 4259

Labbe, A., 3347
Lacombe Dominion Experimental Station, Alberta, 4474
Ladue, J. P., 4234
Lagesse, R. P , 4446v
Lains e Silva, H , 3508
Laird, E. F., Jr., 3986
Lakshmikantham, M., 4378
Lakshminarayan Rao, M. V., 4446w
Lal, K. N., 4379
Lalatta, F., 3455
Lamb, I. M., 4162 l
Lamm, R., 3762
Lana, E. P., 3343
Landrau, P., Jr., 4384
Lane, M. C., 3955y
Lange, W. H., 3790
Langford, M. H., 4361
Langhans, R. W., 4082, 4087
Langvad, B., 3955f
Lanuza, E. A., 4031
LaRue, C. D., 3356
Lavand'homme, C., 3981
Lavigne, —., 3447
Lawes Agricultural Trust, Rothamsted, 4494i
Lawrence, W. J. C., 3430
Lawson, G. W., 4066
Laycock, D. H., 4436
Leblond, C., 3539j
Lee, I. M., 4264p
Lee, R. E., 4162m
Leefe, J. S., 3756
Leeper, H. M., 4054
Lehmann, E., 3780
Leiderman, L., 3946
Lemoine, P., 3981
Lent, J. M., 3804
Leonard, C. D., 4201
Leopold, A. C., 3845
Lepage et Cie, 3466
Lethbridge Experimental Station, Alberta, 4475
Levitt, L. S., 3443u
Levy, A. L., 3443v
Lewis, D., 3451
Lewis, H., 4162n
Lewis, J. M., 3980
Lewis, Y. S., 4442, 4446x
Liard, O., 3457, 3506
Lienk, S. E., 3626
Ligthelm, S. P., 4068n
Lima, A. R., 4023
Lincoln, J. E., 4446v
Lindgren, D. L., 3661
Lindley, C. D., 4115
(Ling, L.), 3573
Linser, H., 3383, 3443w, 3713
Lipp, L. F., 4162o
Lisicyn, D. I., 3393
Little, D. E., 3433
Little, E. C. S., 3696
Little, H. B., 3841
Little, L. D., 4078
Liu, P. D., 4388
Liu, S. Y., 4252
Ljones, B., 3485, 3539p
Ljubenkov, A. A., 3450
Ljubimov, A. A., 3432
Llewelyn, F. W. M., 3679, 3680
Lo, T. T., 4409
Locsin, C. L., 4371
Lodewijks, N. C., 3955z
Loest, F. C., 4246
Loewel, E. L., 3608
Loh, C. S., 4394
Löhr, E., 4162p
López Cristóbal, U., 3645
López-Matos, L., 3984
Loue, A., 4331
Lougheed, A. W., 3387
Lowe, A. C., 3741
Lozovoĭ, D. I., 3640
Lozzia, G., 3660
Lucas, G. B., 3990
Lucas, J. W., 4218
Luck, J. V., 4025
Luddington Experimental Horticulture Station, 4479
Luke, H. H., 4406
Luke, W. J., Jr., 4417, 4446y
Lumry, R., 3361
Luna Moreno, C., 4009
Lundstedt, H., 3582
Lušin, V., 3591
Lyamungu Coffee Research and Experimental Station, Tanganyika, 4324
Lydersen, D., 3443g
Lynch, S. J., 4214
Lyneham, A. J. E., 3973

McAuliffe, C., 3974
McCasland, G. E., 3331
McClain, R. L., 4265b
McClure, T. T., 3615
McCollam, M. E., 4195
MacCollum, G. B., 3831
McCollum, J. P., 3914
McCready, C. C., 3929
McCreary, D., 3648
MacDaniels, L. H., 3487
McElroy, W. D., 3443x
McFadden, L. A., 4091
Macfie, G. B., Jr., 4446z
McGlasson, W. B., 3614
McGregor, S. M., 3921
Machado S., A., 4342
McKeen, C. D., 3952
McKeen, W. E., 3603
McKenzie, D. W., 3472
McKenzie, H. L., 4162q, 4264b
Mackinney, G., 3397
Madagascar, Inspection Générale des Services Agricoles, 4273
Madero Bernal, A., 4296
Madras Department of Agriculture, 4477
Madras, Director of Information and Publicity, 4476
Madsen, H. F., 3632, 3649
Maggs, D. H., 3475
Magie, R. O., 4106, 4108
Maingonnat, A., 3561
Malan, E. F., 4355

Malan, H., 3568
Malcolm, J. L., 3927, 4274
Maliga, P., 3493
Manaresi, A., 3494
Mandryk, M., 3988
Manefield, T., 4264q
Manjarrés Castañeda, E., 4297
Mann, G., 3337
Mann, L. K., 3956a
Mapson, L. W., 3443y
March, R. B., 3685, 3689x
Mariman, G., 3557
Marshall, L. M., 4162r
Martin, H., 3668, 4264r
Martin, J. T., 3689y
Martin, L. F., 4425
Martínez, A., 3332, 4285
Martino, C., 4002
Martorell, L. F., 4415
Marx, K.-H., 3923
Marx, T., 3821
Mastenbroek, C., 3857
Matherne, R. J., 4389
Mathes, R., 4410, 4416
Mathew, E. C., 4068o
Mathew, K. T., 4339
Mathias, M. E., 4137
Mathis, W. T., 3669
Mathur, P. B., 4283, 4347, 4443
da Matta, G. J., 4179
Matthews, L. J., 3699
Matthews, W. S. A., 4248
Mauch, A., 3687
Maurer, E., 3479
Mauritius Sugar Industry Research Institute, 4362
Meadly G. R. W., 3730
Meahl, R. P., 4078, 4079
Mehrotra, B. S., 3956b
Meiffren, M., 4343
Melin, E., 3443z
Menezes Mariconi, F. A., 3639
Menon, K. P. V., 4314, 4321, 4447c, 4447d
Melcalf, R. L., 3685, 3689x
Metlickiĭ, Z. A., 3484
Meudt, W., 3381, 3382
van der Meulen, A., 4349
Michelbacher, A. E., 3637, 3638
Michigan Agricultural Experiment Station, 4494f
Milbrath, D. G., 4113
Milbrath, J. A., 4150
Miller, J. G., 3777
Miller, L. P., 3710
Miller M., R., 4308
Minamikawa, J., 4435
Ministry of Agriculture, Hashemite Kingdom of Jordan, 4478
Ministry of Agriculture, London, 3324, 3325, 3420, 3421, 3444a, 3572i, 3689z, 3690a, 3690b, 3690c, 3690d, 3956c, 3956d, 3956e, 3956f
Mitchell, T. A., 3444b
Mitra, M. N., 4447a
Mitrofanov, P. I., 3995
Modlibowska, I., 3545, 3546
Moffett, J. O., 3424
Mohan Rao, M., 3947
Mollan, T. R. M., 4023
Monin, A., 3579
Montelaro, J., 3955k, 3956p
Monzini, A., 3539k
Moore, J. D., 3599
Moore, J. F., 3856, 3858
Moore, M. H., 3690e
Moore, P. G., 3351
Moran, W. T., 3729
Morettini, A., 3587, 4459
Morris, M. P., 4052
Morrison, A. E., 3663
Moser, W., 3427
Mosse, B., 3355
Mostafa, M. A., 3942
Mott, R. C., 4125, 4126
Muenscher, W. C., 3759k
Mühlendyck, E., 4094
Muir, W. H., 3374
Mukerji, B., 4068t
Mukerji, S., 4419
Mullard, S. R., 4070
Müller, W., 3646
Muma, M. H., 4241, 4264s
Munger, F., 4235, 4236
Mungomery, R. W., 4420
Munsche, D., 3444c
Muntañola, M., 3953
Murray, W., 4447b
Muschett, W. R., 4380
Mushroom Research Association, Ltd., Yaxley, 3872
Musser, H. B., 4120
Mustard, M. J., 4252
Muzik, T. J., 3356
Myrice, F., 3826

Naaldwijk Research Station for Fruit and Vegetable Culture under Glass, 3827, 3911, 3912, 4100, 4104, 4480
N.A.A.S., 4479
Naef, J., 3652
Naef-Roth, S., 3410
Nagel, J. F., 3434
Narasimha Rao, G., 3743
Narasimhan, N. S., 4446p
Narasimhan, R., 4391
Narayana Rao, D., 3388
Narayanaiyer, S., 4336
Narayanan, E. S., 4318
Nason, A., 3443x
National Institute of Agricultural Botany, Cambridge, 3760, 4481
National Institute of Agricultural Engineering, Silsoe, 3688
National Shade Tree Conference, 4494g
Naundorf, G., 3747, 4293
Navarrete S., C., 4330
Navellier, E., 3336
Nayar, T. G., 4278
Neas, I., 3999
Nègre, E., 3572j
Neilson, C. L., 3900
Neiswander, R. B., 4162s
Nelder, J. A., 3776
Nelson, F. C., 3675
Nelson, R., 4251
Nelson, R. O., 4252
Nelson, S. H., 3529
Nesdal, O., 3485
Nesterenko, G. A., 4224
Nettles, W. C., 3980
Neumann, P., 3419, 3786
Neve, R. A., 4040
New York State Agricultural Experiment Station, Geneva, 4484
Newcomer, E. H., 3372
Newell, J., 3935
Newhall, W. F., 4242
Newson, D. W., 3771
Nichol, W. E., 3528
Nicholas, D. J D , 3390
Nichols, L. P., 3690f, 4076, 4162t
Nickell, L. G., 3784
Nickisch, K., 3828
Nicolaisen, N., 3338, 3887
Nicolaisen-Scupin, L., 3887
Nicolaisen, W., 3917
Nicoll, C. P., 3462
Nicoloff, N., 4019
Nielsen, J. P., 3588
Nielson, M. W., 3598
Nigeria Agricultural Department, 4269
Nijveldt, W., 4077
Nilsson, A., 4162u
Nirula, K. K., 4321, 4447c
Nishida, T., 3838
Nitsch, J. P., 3367, 3539 l
Nizi, G., 4110
Noël James, C., 3332, 4285
Noguchi, Y., 3975
Noll, C. J., 3761
Noll, C. R., Jr., 3395
Nolte, H. W., 3690g
Noonan, J. C., 4440
Norman, P. A., 4223, 4237, 4238
Norris, M. V., 3690h
Norris, R. E., 4264t
North, C. P., 4168
Northern Rhodesia Department of Agriculture, 4494h
Novel, P., 3448
Novikof, V. A., 3832
N.S.W. Department of Agriculture, 4482
N.S.W. Department of Agriculture, Division of Horticulture, 4212
Nyhlén, Å., 3585
Nyland, G., 3690q

Oborn, E. T., 3729
Ocfemia, G. O., 4068p
Ochse, J. J., 4264u
Odell, G. V., 3898
Odland, M. L., 3761
O'Donnell, A. E., 3690i
Ognianoff, I., 4016, 4017, 4019
Oland, K., 3507
de Oliveira, W., 4112
Oliver Espinosa, O., 3748
Olmstead, A. J., 3518
Olsen, K. L., 3945
Olson, A. R., 3442
O'Neill, L. A., 4068q
van Onsem, J. G., 4162v
Ontario Department of Agriculture, Vineland, 4484
Oratovskiĭ, M. T., 3484
Orbeck, K., 3963
Orellana, R. G., 4305
Orian, G., 4408
Orillo, F. T., 4403
Orillos, M. O., 4188

Orlando, A., 3639
Orth, H., 3895
(Osborne, A.), 3539m
Osburn, M. R., 3576, 4237
Osnickaja, E. A., 3891
van Overbeek, J., 3375
Overman, A. J., 4124

Padfield, C. A. S., 3584
Padhi, B., 3905
Padmanabhan Nambiar, K. P., 4445
Pagán, C., 4052
Pai, B. R., 4446p
Pakistan Cooperation and Marketing Department, 4250
Pal, N. L., 3971
Paliatseas, E., 4392, 4393
Pandalai, K. M., 4447d
Panjan, M., 3591
Papadopétros, G., 4259
Parfenov, M., 3919
Paris, D., 4011
Parker, R. L., 3424
Parkey, W., 4058, 4059
Parmentier, G., 3583
Parthasarathy, S. V., 4378
du Pasquier, R., 4266
Pass, H. A., 3708
Passlow, T., 4264q
Patel, M. S., 3961
Paton, M. R., 4159
Patton, M. B., 3809
Pavićević, B., 3592
Payen, B., 3622
Pazourková, Z., 3967
Pearce, D. A., 3759 l
Pearce, S. C., 3486
Pearson, C. H. O., 4447e
Pearson, G. A., 3916
Pélécassis, E. D., 4258
Pelletier, R. L., 3690j
Pemberton, C. E., 4447f
Pengelly, R., 3753
Pentzer, W. T., 3368
Perelló Barceló, J. M., 4009
Perkins, H. F., 3408
Perrot, A., 3689b
Pershad, G. D., 3719
Peterson, C. E., 3955w
Petsiavas, D. N., 4249
Pfyer, E., 3566, 3578
Phillips, W. R., 3523, 3524, 3528 3529, 3539q
Pillai, P. N. B., 3961
Pinckard, J. A., 3943
Pinskver, E. M., 3464
Piringer, A. A., 3915
Pirzada, A. G., 4348
Pitcher, R. S., 3644
Plant, W., 3805
Plasman, A., 4092
Platonova, E. M., 3830
Plock, H., 3480
Poapst, P. A., 3500, 3524, 3539r
Poe, C. F., 3808
Poland, J. L., 3714
Polunin, N., 3348
Popov, V. R., 4439
Porritt, S. W., 3519, 3525
Portsmouth, G. B., 4432
Posnette, A. F., 3589, 3600
Post, K., 4162w
(Potter, C.), 4050
Potter, G. F., 3341
Pottier-Alapetite, G., 3347
Prakash, A., 4447h
Praloran, J.-C., 3444d, 4206, 4210, 4211
Prasad, V. G., 4419
Pratt, H. K., 3893
Pratt, R. M., 4230
Preston, A. P., 3467, 3477, 3503, 3504
Price, C. A., 3394
di Prima, S., 4255
Princi, F., 3690k
Puccini, G., 4069
Pugh, A. L., 3402
Purdue University Agricultural Experiment Station, 4485
Puri, B., 4162x
Puzzi, D., 4422
Puzzilli, M., 3966
Py, C., 3750

Quantz, L., 3690 l
Quastel, J. H., 3415
Quenouille, M. H., 4460
Quick, C. R., 3732

R., D. L., 3483
Rademacher, R., 3333
Raeber, J. G., 3962
Ragazzi, G., 4028
Raghavan Nair, K. N., 4049
Rajagopalan, T. S., 4447g
Raleigh, G. J., 3926
Ramachandran, K., 4336
Ramalingam, V., 4444
Rambier, A., 3690m
Ramcke, C., 3444e
Rämsch, H., 3512
Ramsey, G. B., 3896
Ramsfjell, T., 4103
Ranjan, S., 4447h
Ranney, C. A., Jr., 3954
Rao, H. K. S., 4315
Rasmussen, L. W., 3720
Rataj, K., 4068r
Rauterberg, E., 3444f
Raw, G. R., 3539n
Rawlins, T. E., 3985
Ray, T., 4369
Raymond, C. B., 3794
Raymond, W. D., 4350, 4447i
Read, W. H., 3689u
Reark, J. B., 4162y
Rebour, H., 3513, 3572k
Reder, R., 3898
Rediske, J. H., 3407
Reed, G. B., 3976, 4003e
Reeve, R. M., 3543
Regan-Mastnak, A., 3591
Reich, H., 3677
Reisch, W., 3964
Reitsema, J., 4010
Reitz, H. J., 4199
Renaud, M., 4190, 4207, 4264v
Rentschler, H., 3536
Repp, G., 3759m
Resende, F., 4129, 4130
Restrepo P., H., 4302
Retief, D. F., 3959
Reuther, W., 4200, 4213
Reyes, G. M., 4032
Reynolds, H. T., 3690n
Reynolds, H. W., 3892
Rhododendron-Gesellschaft, Bremen, 4157
Ribaldi, M., 3666, 4162z
Ricada, D., 3956g
Rich, C., 4214
Rich, S., 3630, 3690o
Richards, M., 3829
Richards, S. J., 4191
Richter, B., 3515
(Richter, H.), 4462
Ricker, D. W., 4264 l
Riedl, W. A., 4068s
Riehl, L. A., 4232, 4233, 4234
Riera, A., 4446i
(Rijkstuinbouwconsulentschap Maastricht), 3606
Riker, A. J., 3374
Roach, W. A., 3467
Robbins, W. R., 3408
Roberts, E. J., 4425
Roberts, H. A., 3705, 3752
Roberts, J., 3686
Robertson, J. K., 4333
Robertson, J. R., 4401
Robertson, M., 3548
Robertson-Cuninghame, R. C., 3379
Robinson, D. W., 3651, 3689a
(Robinson, J. B. D.), 3749
Robson, J. W., 4115
Rochecouste, E., 3759n
Rodney, D. R., 4221
Rodrigo, P. A., 3883
Rogers, B. L., 3495, 3498
Roistacher, C. N., 4247
Rojas, B., 4447j
Rojecka, N., 3611
Roll-Hansen, J., 3349, 3800
Romney, E. M., 3399
Romshe, F. A., 3772
Roosje, G. S., 3690p
Rosa, M., 3948
Rosanow, M., 3702
Rose, E. S., 4433
Ross Wood, G. A., 4286
Roth, I., 4163a
Rothamsted Experimental Station, 4494i
Rouillard, G., 4375
Rouse, A. H., 4264c, 4264w
le Roux, J. C., 3539o
Rubber Research Institute of Malaya, 3751, 4447k
Ruehle, G. D., 4264x
Runov, V. I., 3837
Russell, O. S., 4267
Russo, F., 4180
Ruszkowska, I., 3956h
Ruxton, J. P., 3545, 3546
Ryle, M., 3414

Saanichton, Dominion Experimental Station, 4491
Sagač, J. A., 3484
Sahm, U., 3821, 3862
Saito, H., 4068c, 4068d
Sakamoto, Y., 4447 l
Salcedo V., D., 4301
Salmon, E. S., 4040

Šalyškina, V. I., 4225
Samantarai, B., 4071
Sambamurty, K., 4444
Samisch, R. M., 3365
Samuels, G., 4384, 4447m
(Sanders, F. R.), 4324
Sankarasubramoney, H., 4447d
Santo Domingo, J. P., 4447n
Sarles, R. L., 3441
Sarma, P. S., 3444i
Šarova, N. L., 4105
Sasaki, S., 3855
Satina, S., 4010
Sauer, H. F. G., 3946
Savinskiĭ, P. I., 3359
Savzdarg, V. E., 3635
Sawada, E., 3855
Scaramuzzi, G., 4149
Scaranari, H. J., 4332
Scarascia, G. T., 4003c
Scarchuk, J., 3804
Ščepotjev, F. L., 3571
Schachtner, N. D., 3863
Schaffnit, E., 3419, 3786
Scharrer, K., 3413
Scheck, H., 3444g
Scheibe, A., 3852
Scheijgrond, W., 3897
Schenk, P. J., 4109
Schindler, A. F., 4135
Schlegal, D. E., 3985
Schlesinger, W., 4054
Schlocker, A., 3690q, 3690v
Schmid, K., 3963
Schmid, V., 4447o
Schmidt, E., Jr., 3956i
Schmidt, H. A., 4151
Schmidt, O., 3712
Schnack, B., 4131
Schneider, I. R., 4003d
Schneider, R., 3444h
Schoenleber, L. G., 4059, 4061
Scholfield, B., 3572l
Schöntag, A., 3541
Schread, J. C., 4143, 4145
Schreuder, W. H. E., 4307
Schroeder, C. A., 4171, 4172, 4174, 4254
Schroo, H., 4376
Schumacher, G. J., 3759k
Schuppe, E., 3540
Schuster, G., 3373
Schütz, F., 3552
Schütze, E., 3456
Schwanitz, F., 3357
Schwartz, D., 3968
Sciaroni, R. H., 3790
Scudder, G. K., Jr., 4200
Seale, P. E., 4284
Šebánek, J., 3922
Sebastine, K. M., 4029
Seely, C. I., 3757
Seifert, F., 3437
Seinhorst, J. W., 3885
Selders, A. A., 3407
Selle, R. M., 4185
Semb, G., 3539p
Semel, M., 3690r
Sen, N. K., 4068f
v. Sengbusch, R., 3551
Senna Braga, O. T., 4037
Serr, E. F., 3572m
Service Botanique et Agronomique de Tunisie, 4487
Service de l'Horticulture, Rabat, Maroc, 4208
Service de la Ptotection des Vegetaux, Algérie, 4239
Seshadri, T. R., 4162x
Shafer, N. E., 3709
Sharif el Din, H., 3759o
Sharma, V. N., 4068t
Sharpe, R. H., 3572n
Shaw, H. R., 4390
Sheat, D. E. G., 3711
Shedley, D. G., 3643
Sheikh, M. A., 4386
Shepherd, R. W., 3803
Sherrer, J. D., 4148
Shimp, N. F., 4199
Shisa, M., 3956j
Siddappa, G. S., 4275
Sidorov, V. S., 4439
Siegler, E. H., 3682
Sierra Leone Department of Agriculture, 4494j
Silina, Z. M., 4118
Silsoe, National Institute of Agricultural Engineering, 3688
Simmonds, N. W., 4279
Simons, A. J., 4494a
Simons, J. N., 3849
Simpson, J., 3491
Singh, H. N., 3745
Singh, K. K., 4187, 4283, 4347, 4443
Singh, R. N., 4447p
Singh, S., 3492
Singh, U. P., 4264y
Singleton, G., 3801
Sites, J. W., 4193, 4215
Sivaramakrishnan, V. M., 3444i
Skinner, H. R. W., 3696
Skripov, I. V., 3770
van Slogteren, E., 4163b
Smirnoff, W., 4240
Smirnov, N. A., 3426
Smith, C. F., 3657
Smith, F. L., 3859
Smith, G. L., 3433
Smith, L. M., 3701
Smith, M. A., 3896
Smith, P. F., 4198, 4200, 4213
Smith, R. H., 4447q, 4447r
Smith, R. J., 4244
Smith, W. L., Jr., 3615, 3819
Sneep, J., 3764
Snyder, H. R., 4068u
Snyder, W. C., 3905
Solovjeva, N. N., 3995
Sorteberg, A., 3903
Sosa, A., 3572o
Sosa-Bourdouil, C., 3572o
Soures, B., 3791
Spangelo, L. P. S., 3539q, 3539r
Spear, I., 3443j
Specht, A. W., 4198
Spence, J. A., 4398
Spencer, D., 3928
Spencer, E. L., 3934
Spencer, H., 4237, 4238
Spickett, R. G. W., 4163c
Spikes, J. D., 3361
Spillner, E., 4446b
Spoon, W., 4307, 4357
Squires, J. A., 4163c, 4447i
Srinivasan, M., 4446w
van Staalduine, D., 3754
Stace-Smith, R., 3636
Stafford, E. M., 4261
Stahler, L. M., 3692
Stamper, E. R., 3744
Stančevič, A., 3592
Stapley, J. H., 3690s
Stapp, C., 3333
Starr, G. H., 3956k
Starý, F., 4068v
Statens Forsøgsvirksomhed i Plantekultur, 3609, 3610
Stehlé, H., 4400
Steib, R. J., 4405
(Steinberg, J.), 4471
Steindl, D. R. L., 4407
Steiner, M., 4021
Steinmetz, H., 3572p
Stepanov, K. M., 4225
Stepanov, S. N., 3474
Stephen, R. C., 3999
Stępniewska, K., 3655
Sterling, C., 3869
Stevenson, G. C., 4366
Steward, F. C., 4279
Stewart, C. W., 4369
Stewart, I., 4201
Stewart, W. S., 4264z
Stitt, L. L., 3787, 3899
Stobwasser, H., 3690t
Stockbridge House Experimental Horticulture Station, 4479
Stoïanova-Ivanova, B., 4018
Stoll, K., 3533
Stone, J. D., 3701
Stone, M. W., 3871, 3955y
Storey, I. F., 3874
Storey, W. B., 4253, 4264o, 4265a
Storrs, E. E., 3788
Stoughton, R. H., 3529s, 4163d
Stout, G. L., 3593, 3690u, 3690v, 3759, 4265b
Stover, R. H., 4282
Strauss, E., 3572q
Street, A. T., 3438
Street, H. E., 3921
Strmecki, E. L., 3404
Strømme, E., 4132, 4133
Stubbs, L. L., 3904
Stugard, B., 4217
Sturgess, O. W., 3621
Sturgis, M. B., 4381
Subba Rao, M. S., 4379
Subbayya, J., 3539t
Subramanian, N., 4446w
Sudds, R. H., 3670
Sugawara, T., 3396, 3975
Sugiyama, T., 3549
Suit, R. F., 4226
Sullivan, W. N., 3689q
Sun, V. G., 4388
Sussex, I. M., 3921
Sutcliffe, J. F., 3370
Swamy, A. Y., 4309
Swank, G., Jr., 3822
Sylvain, P. G., 4447s
Sylvester, E. S., 3936

Taboada, O., 3334
Talboys, P. W., 4044
Tandon, S. L., 4163e
Tang, C. K., 4394

Tanganyika Coffee Research and Experimental Station, Lyamungu, 4324
Tanganyika Government Chemist, 4447t
Tanner, H., 3536
Tarantola, C., 3392
Tashiro, H., 3641
Tassinari, M. M., 3616
Tattershall, J. T., 4095
Tauber, O. E., 3850
Taylor, E. A., 3836
Taylor, W. E., 4061
Templeton, J. K., 3724
Tepe, W., 4163f
Terentjeva, M. V., 3930
Tew, R. P., 3628
Thakar, C., 3745
Thellet, B., 3622
"The Rhodesian Farmer", 4486
Thermes, R., 3789
Thiel, K., 3468
Thiem, E., 3647
Thiem, H., 3690w
Thimann, K. V., 3394, 3443j
Thiollière, J., 3622
Thomas, D. G., 4338
Thomas, N. F., 3945
Thompson, E. C., 3467
Thompson, F. B., 3696
Thompson, F. C., 4042, 4043, 4047
Thompson, J., 3722
Thompson, W. L., 4219, 4230
Thomson, B. F., 3844
Tidbury, G. E., 4270
(Tilford, P. E.), 4494g
Till, J. F., 3733
Tincknell, R. C., 3741
Tinsley, T. W., 4304
Tjutin, M. G., 3949
Tocklai Experimental Station, 4493
Todd, B. J., 3765
Todd, F. A., 3990
de Toledo, A. A., 3654
Tombesi, L., 4000
Tometorp, G., 3762
Tonnier, J-P., 4005
Topor, J. A., 3484
Torgeson, D. C., 4150
Torii, H., 4438
Torres, J. P., 4031
Toth, S. J., 3399
Toumanoff, C., 3667
Townsend, J. F., 3631
Toxopeus, H. J., 4030
Treggi, G., 3865
Trulevič, V. K., 3802
Trullinger, R. W.), 4489
Truscott, J. H. L., 3531
Trusevič, G. V., 3484
Trupin, F., 3435
Tseng, P. M., 4394
Tucker, R. W. E., 4447u
Tuckett, A. J., 3759p
(Tuller, W. N.), 4455
Tunis, W. D., 3670
Tunisie, Service Botanique et Agronomique [S.B.A.T.], 4487
Turner, H. E., 4153
Turnipseed, G. F., 3657
Tydeman, H. M., 3476

Ueno, Y., 3955u
Uganda Department of Agriculture, 4494k
Uhlig, S., 3690x
Uldal, B., 4103
United Planters Association of Southern India (U.P.A.S.I.), 4494l
Upshall, W. H., 3510
Urquhart, D. H., 4286
U.S. Department of Agriculture, 3326, 4488, 4489, 4490
U.S. Department of Agriculture, Bureau of Agricultural Economics, 3766
U.S. Department of Agriculture, Foreign Agricultural Service, 4265c, 4322, 4323
Usher, G., 4304
U.S. Interdepartmental Committee on Pest Control, 3690y

Vail, W. A., 3690h
Vaile, J. E., 3560
(Valdeyron, G.), 4494m
Vallaeys, G., 4327
Valle, T., 3782
Valleau, W. D., 3989
Vanderford, H. B., 4265d
Vanstone, F. H., 3444j
Vasil, I. K., 4163e
Vasyutin, V. F., 4449
Veiga, A. de A., 4335
Veksthusforsøksfondets Komité for prøvedyrking av Chrysanthemum, 4163g
Velazquex Diaz, J., 4265e
Veldstra, H., 3377
Venkataramani, K. S., 4434, 4447v
Venkatesh, C. S., 4163h
Venkateswarlu, P., 3388
Verdura, R., 4001
Vergnes, A., 3623
Verkerk, K., 3799, 3886
Verzele, M., 4048
Vicente, S., 3671
(Vickery, L. S.), 3958
Victor, —., 3436
Vijayasaradhy, N., 4391
Vince, D., 4163d
Vinokur, R. L., 4205
Virgin, H. I., 3444k
Visser, T., 3459
Vittorio, P. V., 3976, 4003e
van der Vliet, M., 3882
Vlitos, A. J., 3381, 3382
Vogel, W., 3581
Volcani, Z., 3938
Volk, R., 3974
Volodarskiĭ, N. I., 3977
Vos, H., 3897
de Vries, D. A., 3363
Vyvyan, M. C., 3475

Waddell, C. W., 4424
Wade, P., 3417
Wadsworth, R. V., 4306
Wageningen, Instituut voor de Veredeling van Tuinbouwgewassen, 4472
Wagnon, H. K., 3595, 3690v, 3759
Wahid, M. A., 4405
Wahl, I., 3938
Wakil, A., 3739
Walker, A. H., 3731
Walker, J., 4097
Walker, J. C., 3848
Walker, J. H., 3539u, 3539v
Walkof, C., 3956l
Wallace, A., 4168, 4194
Wallace, T., 3444l
Walter, J. M., 3955x
Walter, N., 4447w
Walters, H. J., 3956k
Wander, I. W., 4193
Wang, C. C., 4395
Wang, S. C., 4447x
Ward, R. K., 3759p
Warington, K., 3405
Warnock, S. J., 3843
Wartenberg, H., 3333
Wasowicz, T. E., 4295
Wasscher, J., 4163i
Wassenaar, L. M., 3572r
Watanabe, H., 3855
Watson, D. P., 3820
Watson, M. A., 3810
Way, M. J., 4320
Waywell, C. G., 3734
Webster, G. R., 3416, 3422
Weed, R. M., 3710
Wegenaar, C., 3662
Weick, F. E., 3439
Weinstein, L. H., 3408
Weintraub, R. L., 3380
Wellensiek, S. J., 3886
Wellesbourne, National Vegetable Research Station, 3956m
Wells, J. S., 3428
Wender, S. H., 3572s, 3834, 4356
Went, F. W., 3444m, 3444n
White, D. G., 3458
White, D. J. B., 3353, 3354
White, E. P., 4068w
White, R. G., 4295
White, W. E., 3440
Whiting, A., 4163j
Whitner, B. F., Jr., 3956n
Wiant, D. E., 3334
Widhelm, H., 3565
Wiehe, F., 4446v
Wierszyłłowski, J., 3740
Wiggans, S. C., 3888
Wijewardene, R., 4316
van Wijk, W. R., 3363
Wilcox, J., 3956o
Wilder, E. A., 4068x
Wildman, S. G., 3443o
Wilhelm, A. F., 3625
Wilhelm, S., 4175
Wilkinson, E. H., 3605, 3619
Williams, B. L., 3572s, 3834, 4356
Williams, J. R., 4413
Williams, K. T., 3931
Williams, R. F., 3350
Wilson, D. J., 3553
Wilson, J. D., 3826
Wilson, J. F., 4044
Wilson, W. F., 3956p
Winkler, —., 3689w

Winoker, J., 4249
Winsor, A. P., 3574
Wismer, C. A., 4447y
Witrant, R., 4265f
Witte, K., 3923
Wittwer, S. H., 3820
Wolcott, G. N., 4411, 4447z
Wolf, B., 4074
Wolfe, H. R., 3597
Woltz, S. S., 4106
Wong, P. S., 3397
Wood, C. A., 3544, 3548
Wood, J. G., 3391
Woodhams, D. H., 3860
Woodhead, C. E., 3472
Woods, J. J., 4491
Woon, P., 3584
Wormald, H., 3612
Wort, D. J., 3385
Wright, D. W., 3815, 3816, 3894
Wright, W. R , 3896
Wulff, H D , 4163k
Wye College Department of Hop Research, 4039
Wyman, D., 4138
Wynd, F. L., 3987

Yamaoka, A., 4068d
Yankovitch, L., 3779
Yarwood, C. E., 3617, 3866
Yee, W., 4101
Young, P. A., 3943
Young, R. A., 4150
Young, R. E., 3518
Youngken, H. W., Sr., 4068y
Yuncker, T. G., 4068z, 4155
Yusuf, N. D., 4386

Zabavskaja, K. M., 3371
Zaitlin, M., 4163 l
Ždanova, L. P., 4057
Železnova-Kaminskaja, M. A., 4140
Zentmyer, G. A., 4173, 4174, 4175
Zielinski, Q. B., 3539w
Zimmerman, L. H., 4058
Zimmerman, P. W., 3376
Zonderwijk, P., 3695
Zuberbühler, —., 4163m
Žučkov, N. G., 3505
van Zuilen, E. J., 4431
Zuñiga, L. C., 4313
Zwintzscher, M., 3539x

# INDEX OF NAMES

## Horticultural Abstracts, Vol. XXIV

N.B.—Brackets round the name denote that this person, although not the author, was directly or indirectly concerned with the article.

Aamlid, K., 468
Abad Manrique, J. B., 4009
(Abbiss, H. W.), 2104
Abbott, D. L., 174, 2284
Åberg, B., 1102
Åberg, E., 3282
Abi-Fadel, J. F., 140
Abiusso, N., 3083
Abraham, E. V., 2019
Abrahamse, S., 1183
Abrahão, T., 4337
Abramov, N. A., 1194
von Abrams, G. J., 464
Abson, J. W., 1732
Adam, A., 372a
Adams, R., 615a, 615b
Adams, R. E., 363, 2535
Adamson, N. J., 1697a
Adamson, R. M., 3769
Adsuar, J., 3269a, 3269s, 3984
Aerts, R., 1338
Agarwala, S. C., 434
Agassiz, Dominion Experimental Farm, British Columbia, 3295
Agati, J. A., 3883, 4033
Aggarwal, J. S., 1742j, 4003b
Aghoramurthy, K., 615c
Agricultural Research Council [London], 3296
Aguirre, J. T., 228
Ahlberg, O., 1544
Ahlers, N. H. E., 2322a, 4068q
Ahmad, S., 4264a
Ahrendt, L. W. A., 2990
Airan, J. W., 542a
Aitkenhead, P., 1296
Aiyadurai, S. G., 3143, 3269b
Akamine, E. K., 940, 4263
Akenhead, D., 79a
Akesson, N. B., 1485a
Akhurst, C. G., 2021
Akour, A. A., 4062
Aksu, S., 1692
Aladžajkov, L., 1492
Alagna, N., 2358
de Alba, J., 4446a
Alban, E. K., 389
Albareda Herrera, J. M., 3778
Alben, A. O., 242, 2386
Albrecht, D., 1307
Alcaraz-Mira, E., 2852
Aldebert, —., 2348
Alderfer, R. B., 3539a
Alderman, D. C., 785
Alderton, G., 4068a
Aldrich, D. G., 3100a
Aldrich, R. J., 1485g, 2556, 2587, 2593
Aleksandrov, A. D., 1849
Alekseenko, R. D., 1155
Alekseeva, M. V., 1593
Alexander, L. J., 2838a
Alexander, W. P., 4446b
Alfaro, A., 3671
Algérie, Gouvernement Général, 2096
Allam, M. E., 2466
Allan, H. R., 1346
Allard, R. W., 458, 2680, 2702, 3859, 3955a, 3955b
Allayyanavaramath, S. B., 1013
Allen, E. F., 1937
Allen, E. K., 34
Allen, F. W., 2293
Allen, H. T., 1813a
Allen, H. W., 3650
Allen, M., 3679, 3680
Allen, N., 1686, 3996
Allen, O. N., 34, 2687
Allen, P. J., 3604
Allen, S. E., 1573
Allentoff, N., 3523
Allerton, F. W., 1589, 1624, 4448
Allington, W. B., 3986
Allmendinger, D. F., 2498, 3858
Allnutt, R. B., 1932
Allo, A. V., 3728
Allsopp, A., 3369
de Almeida, J. R., 3208
Alpatjev, A. V., 2791
Alscher, R. P., 1647a
Althuisius, F., 2006
Altman, R. F. A., 4006
Alvarez-García, L. A., 1683, 3185
Alvim, P. de T., 1985, 3128, 3153, 4291
do Amaral, S. F., 1999
Amateur Gardening Handbooks, 4494a
Ames, O., 2080
Amico, A., 684
Amin, F. Y., 673
Amling, H., 2592
Amphoux, M., 2471
Amsterdam, Royal Institute for the Tropics, 1050, 1061o
Amy, A. S., 3984
Anand, J. C., 2001
Anandan, A. P., 891, 4314
Anantanarayanan, K. P., 3140
Andersen, A. L., 459
Andersen, H., 1061f
Anderson, E. D., 2621a
Anderson, H. W., 282, 372a
Anderson, J. C., 2208a
Anderson, J. F., 181
Anderson, L. D., 529, 1523
Anderson, W. H., 2745
Anderson, W. S., 2659
Anderssen, F. G., 2622
Andison, H., 1381, 4114
Andrade, A. C., 1862, 4422
Andrén, F., 1339
Andrew, W., 3759a
Andrews, F. W., 3759a, 4494b
Andrews, P. S., 644
Andronov, N. M., 2984, 4139
Anet, E. F. L. J., 1215
Anicié-Bosnjak, Z., 1295k
Anjaneyulu Naidu, N., 1844
Anjou, K., 2419, 2420
Ankinovič, G. B., 3432
Anley, D., 2196
Anon., 67, 77, 79b, 79c, 151, 205, 217, 221, 225, 311, 372b, 372c, 418, 480, 481, 490, 536, 566, 580, 623, 739, 929, 930, 932, 970, 1016a, 1068, 1081, 1126, 1138, 1139, 1142, 1145a, 1145b, 1174, 1217, 1249, 1299, 1428, 1429, 1453, 1455, 1462, 1469, 1485b, 1491, 1493, 1548, 1638, 1647b, 1654, 1655, 1713, 1720, 1722, 1728, 1770, 1775, 1786, 1815, 1827, 1836, 1912a, 1926, 1934, 1940, 1977, 2026, 2042, 2062, 2074, 2078a, 2078b, 2128, 2190, 2203, 2208b, 2214, 2475, 2715, 2744, 2815, 2838b, 2840, 2851, 2859, 2920, 2922a, 2964, 3069, 3100b, 3100c, 3121, 3181, 3227, 3238, 3257, 3329, 3418, 3454, 3509,

3534, 3539b, 3674, 3676, 3835, 3877, 4068b, 4072, 4412, 4446c, 4446d
Anstett, A., 1282
Anthon, E. W., 2432, 3597
Antoniani, C., 3782
Antonjuk, A., 1496
Antony, J., 4321, 4447c
Antunes Filho, H., 1990
Aomori Apple Experiment Station, 3539c
Apple, S. B., Jr., 467
Aramayo, H. S., 1824
Araneta Institute of Agriculture, Philippines, 2114
Araneta, R. R., Jr., 601
Arant, F. S., 4148
Arceneaux, G., 2063, 4365
Archibald, J. A., 3510
Archibald, J. F., 3122
Arcihovskaja, E. V., 138
Arisumi, T., 940, 1168
Arizona Agricultural Experiment Station, 3323a
Ark, P. A., 2443, 2445
Armand, J. E., 1645
D'Armini, M., 570, 571, 577a
Armitage, H. M., 1398, 4264b
Armstrong, G. M., 4085
Armstrong, J. K., 4085
Armstrong, J. M., 3759b
Arney, S. E., 212, 3547
Arnold, C. Y., 1629
Arnon, D. I., 1120
Arrica, N. N., 238
Arroyave Vargas, G., 375
Arruda, S. C., 2058
Arsoy, I., 1295a
Arthington, W., 2322h
Arthur, H. R., 4446e
Artozoul, J., 1261
Arvan, P. G., 2183
von Arx, J. A., 2768
Arzee, T., 1912b, 3100d
Asai, T., 4068c, 4068d
(Asami, Y.), 3768
Asen, S., 697, 1788, 2939, 2948
Ashizawa, M., 1201, 1480
Ashour, W. E., 2466
Askew, H. O., 576, 2863, 2897
Asociación de Técnicos Azucareros de Cuba, 3197
Aspinall, G. O., 1742a
Asquith, D., 2545a
Astrego, J. J., 3767
Atcheson, W. C., 4127
Atchison, E., 1145i
Athrey, N. B., 4446f
Atkins, C. D., 4264c, 4264w
Atkins, E. L., Jr., 799, 4229
Atkins, F. C., 2727
Atkinson, F. E., 1236a
Atkinson, J. D., 3590, 3594
Atkinson, R. G., 1608
Atmore, S., 735m, 2946, 4078
Atomic Energy Research Establishment, 3443a
Audus, L. J., 27, 1018, 1576
Aughtry, J. D., 3212, 3215
Auguste, A., 4209
Australia, Commonwealth Dried Fruits Control Board, 1295b
Australia, C.S.I.R.O., 135, 195, 235, 382, 546, 758, 1039, 3445, 3517, 3567, 3697, 3718, 3783, 3785, 3909, 3957, 4064, 4467
Australia Department of Health, 1414
Australian Canned Fruits Board, 2119a
Auxence, E. G., 589
Åvall, H., 3762
Averell, P. R., 3690h
Avidov, Z., 323, 372d, 794
Avramov, L., 227, 3563
Ayers, A. D., 486, 2753
Azoff, M. B., 4013

B., G., 2057
Bachmann, F., 348, 1430, 1432, 1434
Bacon, O. G., 456, 2494
Baecker, P., 735a
Bagenal, N. B., 1027, 2210
Baggiolini, M., 332
Bagnall, B. H., 2489
Bagot, Y., 1910
Bahtadze, K. E., 1001, 3244
Bailey, G. F., 4264g
Bain, D. C., 3813
Baines, R. C., 795
Bajwa, B. S., 3100e
Baker, C. E., 200
Baker, G. A., 2132
Baker, H. G., 735b
Baker, K. F., 666, 1754, 2953, 2982, 3011a
Baker, R. E., 2132, 2264
Baker, R. E. D., 878, 1016b, 1939, 1941, 1961, 2078c
Baker, R. S., 29
Baker, V. H., 3334
Bakhuizen, H. L. van de Sande, 2156
Bakker, M., 3902
Balcom, R. B., 2571
Bald, J. G., 666, 672, 2965
(Baldacci, E.), 1642
Baldassari, T., 1019
Baldin, P. G., 1622
Baldini, E., 89, 123, 1895
Balks, R., 2136
Ballot, R., 4206
Baltadori, A., 2224
Balzak, S. S., 4449
Banfi, A., 1828, 1912c
Banga, O., 1647c, 2762
Bangdiwala, I. S., 3239, 3270k, 4415
Banigan, T. F., Jr., 615d
Bannerman, L. W., 2587
Baňoch, Z., 1742e
Barak, D., 3496
Baranek, P. P., 1485c
Baranova, A. P., 1195
Baranovskiĭ, A. L., 1272
Barat, M. H., 4340, 4341
Baratte, J., 1603
Barbados Central Sugar Cane Breeding Station, B.W.I., 4367
Barbados Department of Science and Agriculture, 4461
Barber, A. C., 4450
Barbier, M., 941
Bareau, P., 853
Barger, W. R., 2833
Bargioni, G., 267
Barker, B. T. P., 3539d, 4451
Barker, J. S., 3850
Barkley, F. A., 1412
Barltrop, J. A., 1711
Barnabas, J., 542a
Barnard, G. K., 1134
Barnes, A. C., 1016c, 1020, 2078d, 4363
Barnes, M. M., 3651, 3659, 3689a
Barnsley, G. E., 2898
Barr, W. L., 1129
Barrau, J., 837
Barret, W. H. G., 1813b
Barsukov, L. N., 3371
Bártfay, T., 1571
Barth, T., 3271
Barthelet, J., 635
Bartholomew, E. T., 4234
Bartlett, B. R., 1876
Bartley, B. G., 1016d
Bartolome, R., 4299
Barton, L. V., 4141
Barua, P. K., 3243
Basanjko, A. A., 1279
Bashir, C. M., 3951
Baskin, A. D., 2563, 2620
Basu, G., 2003
Basutoland Department of Agriculture, 3323b
Batchelor, L. D., 3044
Bates, G. R., 1678
Batinica, J., 3658
Batjer, L. P., 145, 2285, 2403, 3495, 3498
Batra, B., 577b
Batra, H. N., 3840
Batt, R. F., 371
Battaglini, A., 832m, 1912k
Bauckmann, M., 2504
Baud, C., 4162a

Baudel, J., 1261
Bauer, A. H., 3690f
Baumann, G., 2701
Baumeister, G., 2456
Baumgardt, J. P., 2826
Bavaud, J., 4158
van Bavel, C. H. M., 1669, 2850
Baver, L. D., 3225, 3269c
Bawden, F. C., 572, 2855, 3810
Baxter, L. W., 714, 3011b
Bazán de Segura, C., 3575, 3867
Bazzi, B., 3055
Bazzigher, G., 1364
Beach, R. G., 645
Beam, R., 912
Bean, A. G. M., 57, 58
Bean, G., 60, 419
Bear, F. E., 412
Beard, F. H., 4041, 4042
Beater, B. E., 3221
Beatty, A. V., 4098
Beatty, J. W., 4098
Beatty, R. H., 2579
Beaufils, E. R., 2029, 4359
Beaumont, A., 1813c, 2823, 4162b
Beaumont, J. H., 1984
Beaverlodge Dominion Experimental Station, Alberta, 3297
Beckenbach, J. R., 1647r
Becker-Dillingen, H., 3586
Becker, E. M., 1460
Becker, H., 2208c
Becker, T., 1145c
Beckham, C. M., 426
Beckley, M. S., 2575
Bedsole, M. R., Jr., 3211
Beecher, F. S., 449
van Beekom, C. W. C., 3880
Begg, J. A., 1688
Beier, R. L., 3100o
Beijer, J. J., 2963, 4119
Bel, 3429
Beley, —., 1016e
Belić, A., 2208d
Beljakova, M. B., 3656
Bell, K. E., 2260
de Bellefroid, V., 1963
Belloni, V. G., 2454, 2519
Beltrán Galindo, G., 3106
Benassy, C., 347
Beñatena, H. N., 1828, 1912c
Benedict, H. M., 3588
Benincasa, M., 1656
Ben-Meir, Y., 793, 832a
Bennett, A. J., 888
Bennett, R. R., 1445
Bensa, S., 685, 2966
Benson, N. R., 3502
Bental, A., 1859
Bentley, J. A., 79d, 3443b
Benvegnin, L., 2378
Beraha, L., 293, 3796, 3797
Berbeć, J., 1682
Berezowski, B., 3969
v. d. Berg, C., 2129
Bergann, F., 3003, 3335
Berger, K. C., 2208h, 2687
Berger, S., 1591, 1632
Berggren, Å., 7
Bergmann, W., 4068e
Bermuda Department of Agriculture, 1061b
Bernal E., G., 1991
Bernard, G. E., 2562
Bernard, J., 2545b
Bernardy, P., 4385
Bernhard, R., 2255
Bernon, G., 2471
Bernstein, L., 486, 2753, 3916
Beroza, M., 4053
Berrill, F. W., 1920
Bervillé, P., 2511
Bessard, —., 3689b
Bester, J. J. A., 1224
Bevenue, A., 80i, 3931
Beyers, E., 2399
Bezlur Rahman, M., 2303
Bezzi, E. M., 2652
Bharucha, F. R., 1088, 4060
Bhat, J. V., 581, 1707
Bhati, A., 2078e, 2078f
Bhatia, B. S., 79y, 3046, 4275
Bhatia, I. S., 543i, 1721
Bhatnagar, V. B., 477, 2771
Bhattacharyya, S. C., 2078f
Bheemeswar, B., 1742b
Biale, J. B., 802, 832o, 3518, 4243
Białobok, S., 1799
Bianchedi, A., 2360
Bianchi, H., 345
Bicudo, L. P., 2078g
Biddulph, O., 21, 1117
Bidwell, R. G. S., 1145d
van der Bie, G. J., 1016f
Biebl, R., 2184
Bielka, R., 1487, 3775
Bielsalski, E., 72
Bigornia, A. E., 1974
de Bijl, D., 244c
Billerbeck, F. W., 183
(Binfield, R. E.), 3539e
Bing, A., 2994
Bingham, F. T., 3015, 3068, 3402
Biologische Bundesanstalt f. Land- u. Forstwirtschaft, Braunschweig, 2398, 4462
Biologische Zentralanstalt für Land- u. Forstwirtschaft in Berlin-Dahlem, 2081
Birchfield, W., 995
Birk, H., 2349
Birkett, L. S., 969, 4368, 4377, 4446g, 4446h
Biron, M., 2352
Bisaillon, L., 49
Bishop, C. J., 1813d, 2229, 3453
Bisset, N. G., 2922b
Bitancourt, A. A., 1863
Bitters, W. P., 760, 787, 1855, 3044, 3100f
Bixby, D. H., 2650
Black, C. J., 3572a
Black, J. N., 1144
Blackith, R. E., 1516
Blacklock, J. S., 1704
Blackman, G. E., 1144, 3379
Blackmon, G. H., 256, 2387
Blaha, J., 1321, 2395a
Blaich, O. P., 4268
Blair, B. O., 2580
Blake, C. E., 2302
Blake, G. R., 1647h
Blakeslee, A. F., 48, 4010
Blanchet, R., 2407
Blank, B. B., 3955c
Blankholm, E., 2627
Blasberg, C. H., 2277
Blasingame, R. U., 4334
Blasse, W., 2322m
Blaszinsky, J., 2208c
Bleasdale, J. K. A., 1084
Bleidner, W. E., 3703, 3704
Bless, A. A., 80h
Blinks, L. R., 3443c
Bloch, R., 372e
Blodgett, E. C., 3463
Bloemsma, D., 4144
Blomfield, P. D., 3846
Blommaert, K. L. J., 3079
Blommers, J., 244c
Blondel, L., 4189, 4216
Blondin, P., 79c
Bloom, J. R., 524
Blumer, S., 1514
Blunck, H., 1687, 2082, 3272
Blundell, E., 2064
Board, P. W., 4284
Boawn, L. C., 2693, 2694
Bobb, M. L., 3683
Bocchi, A., 1112
Bocquet, —., 954
Bode, O., 1679
Boek, K., 2405
Boeke, J. E., 78
de Boer, S., 680, 721
Böhm, H., 2495, 2506
Böhm, O., 317, 2954
Bohmont, D. W., 3691, 3717, 3738, 3759c
Bohn, G. W., 542b, 1613
Böhnert, E., 1769, 4094
Boičinov, A., 615e
de Boixo, —., 765
Bokučava, M. A., 2073, 4439

Boland, P., 3013
Boles, J. N., 754
Bolgarev, P. T., 2361
Boll, W. G., 1647d, 2208y
Bollard, E. G., 1207
Bolle, F., 372f
Bolle-Jones, E. W., 2078h, 3192, 4360
Bolli, M., 560, 1693
Bollow, H., 1766
Bolsunov, I., 554, 562, 1664, 1674, 4003a
Bolsunov, T., 1697b
Bolton, A. T., 2470
Bömeke, H., 266, 1199, 1435a, 2292, 2415
Bomhay, B. B., 527
Bonazzi, A., 3997
Bond, J. A. B., 916, 1997
Bonde, E. K., 1104
Bonfante, S., 3086
Bongiovanni, G. C., 2453, 2492
Bonnemaison, L., 1605
Bonner, J., 31, 832o, 2160, 3273
Bonnet, J. A., 1016g, 4446i
Bontovits, L., 2795
Borck, B., 2248, 2418
Bordeleau, R., 2567, 3723
Borden, A. D., 372g, 1435j, 3632, 3649
Borden, R. J., 2036
Borders, H. I., 2664
Borget, M., 4325
Borgman, H. H., 2250
Borihina, M. G., 1733
Börner, C., 1435b
Borzini, G., 2724
Bosch, H., 709
van den Bosch, R., 1912d
Bose, A. N., 2003
Boselli, F., 1385, 4260
Bösenberg, K., 1402
Bosian, —., 4093
Boskoop, "de Proeftuin" te, 617, 696
Bosley, D. A., 735c
Boswell, S. B., 4221
Boswell, V. R., 3955d
Botley Fruit Station, 1244
Bóttari, V., 812, 832s
Bottger, G. T., 4053
Bottini, E., 2316, 3392
Bottrell, P. C., 2322b
Bouat, A., 820, 1900
Boubals, D., 2483, 3623
Bouché-Thomas, E., 2083
Bouillenne, R., 2797, 2798
Bouillenne-Walrand, —., 2737
Boulay, H., 3483
Bould, C., 148, 156, 254, 257, 1435c, 2177, 3555
Bouriquet, G., 1016h
Bourne, B. A., 987
Bousard, M., 1560
Bousser, R., 1235
Bouvet, E., 3242
Bovay, E., 3577
Bovey, R., 3601
Bowen, J. F., 1236b
Bowers, F. A. I., 828
Bowler, W. W., 1016i
Bowles, E. J., 630, 637
Box, H. E., 994
Boxall, H. G., 3875
Boyes, W. W., 3092
Boyle, J. S., 372h, 3689c
Boynton, D., 146, 2276, 3411
Braadlie, O., 2270
Bradley, R. H. E., 2854
Bradt, O. A., 3497
Bragg, K. K., 3727
Bramble, W. C., 2577
Bramley, W., 2211
Branas, J., 1357
Brandon Dominion Experimental Farm, Manitoba, 4463
Brannaman, B. L., 3047
Brantley, B. B., 538
Branzanti, E. C., 201a
Brase, K. D., 120, 127
Braun, A. C., 1697c
Braun, O., 3955e
Brauner, L., 3364
Bravenboer, L., 1554
Break, R. A., 2503
Breazeale, E. L., 20
Breece, J. R., 3595
Breggar, T., 3211
Breider, H., 223, 2351, 2363
Bremer, A. H., 1623
Brenière, J., 991
Brenna, H. K., 3955f
Breny, R., 343
Breteau, J., 4265f
Brett, C. H., 2707
Brett, P. G. C., 4370, 4446j
Breviglieri, N., 201b, 2239, 2262, 2353
Brewer, D., 1577
Brewer, H., 2838c
Brežnev, D. D., 2787
Brian, P. W., 2545c
Briand, —., 3473
Briant, A. K., 886
Brichet, J., 3082
Bridgers, B., 735d
Bridgland, L. A., 3127
Bridgmon, G. H., 3956k
Brierley, P., 518, 698, 701, 719, 735l, 3011c, 3011d
Briggs, D. R., 1811
Briggs, L. H., 1724c
Brigham, W. T., 3633
Brindley, T. A., 1581, 2706
Bringhurst, R. S., 737
Brink, V. C., 3011e
British Columbia Department of Agriculture, 3323c
British Columbia Vegetable Breeders' Committee, 2623
British Council, 1069
British Honduras Department of Agriculture, 4464
British Weed Control Conference, 2547
British West Indies Sugar Association, 3198
Broadbent, B. M., 3064, 4235, 4236
Broadbent, L., 437, 1539
Broatch, J. D., 1932
Brock, R. D., 1773
Brodie, A., 3733
Broertjes, C., 703
Broeshart, H., 4351
Broker, R., 581, 1707
Brook, P. J., 2464, 3607
Brooke, D. L., 1489
Brooks, A. N., 3572b
Brooks, R. M., 1159, 4452
Brossier, J., 1566
Brown, A. H., 3360
Brown, B. A., 1503
Brown, C., 51
Brown, C. P., 832b
Brown, D. S., 140, 162, 2222
Brown, E., 579, 2879
Brown, E. B., 372i, 1376
Brown, E. S., 4319
Brown, F. B., 2013
Brown, H. B., 3123
Brown, H. D., 2807
Brown, J. C., 41, 577c
Brown, J. G., 821
Brown, J. W., 153, 2552
Brown, N. C., 2922c
Brown, R., 2145
Brown, W. H., 1449
Browning, H. A., 3777
Brozzetti, P., 2915
Brubaker, R. W., 2707
Brückbauer, H., 2512
Bruder, J., 2749
Bruehl, G. W., 3269d
van den Bruel, W. E., 313
de Bruin-Brink, G., 1697d
Bruinsma, F., 3885
Brun, J., 849, 4280
Bruns, V. F., 390
Brunson, M. H., 3650
Brusca, J. A., 1855
Brusca, J. N., 738, 777, 3014, 3027, 3028, 3036, 3100f, 4167, 4169, 4170, 4177, 4178, 4197, 4204
de Bruyn, J. W., 4020
Bry, A., 3482

Bryn Adda Horticulture Demonstration Station, 1062, 4479
Buchanan, W. K., 985
(Buchholtz, K. P.), 1461
Buchholz, W., 73
Buchloh, G., 3488
Buchloh, S., 2427
Buck, C. C., 3700
Buck, G. J., 2979
Buckley, R., 3955g
Budaga Rao, J., 1739
Budagovskiĭ, V. I., 3465
Budnickaja, E. V., 3889
Buehrer, T. F., 615g
Buhl, C., 3811
Bukowski, T., 3955h
Bulanda, M., 1196
Bulat, H., 3011n
Bullard, E. T., 496
Bullen, E. R., 2690
Bullwinkel, B., 33
Bundesanstalt für Qualitätsforschung, Geisenheim, 2137, 2301, 2329, 2658, 2660, 2662, 2803, 3298
Bünsow, R., 79f, 735e, 2208q
Bunt, A. C., 2187
Burchfield, H. P., 3788
Burden, E. H. W. J., 4062
Bureau of Agricultural Economics, U.S. Department of Agriculture, 805
Burg, J. P. L. L. A., 1706
Burger, I. J., 1647g
Burgess, E., 229
Burgesser, F. W., 1473
Burgher, A. T., 97
Burgis, D. S., 1648b
Burke, J. H., 4182, 4217, 4265c
Burke, O. D., 542c, 4076
Bürke, R., 3413
Burkholder, W. H., 647
Burle, L., 4288
Burleigh, C. H., 3240
Burma, D. P., 79g
Burr, G. O., 3214
Burris, R. H., 2154, 3395, 3443d
Burström, H., 2208e, 3366
Burton, J. C., 2687
Busch, W., 2628
Businger, J. A., 69, 1133, 2424
Busschots, —., 260
Busschots, A., 1344
Butijn, J., 2209a
Butler, C. G., 3491
Butler, J. R., 2208f
Butler, L. I., 2542
Butts, J. S., 467
Buxton, E. W., 2699
Buzacott, J. H., 2078i, 4372, 4446k
Byass, J. B., 2538
Byerrum, R. U., 1103
Bykov, B. A., 4354
Bykovskaja, I. P., 3977
Byrde, R. J. W., 291, 1417, 3613
Byrnes, W. R., 2577
Byrnside, D. S., Jr., 4381

Cabo Torres, J., 2888
Čača, A. E., 3995
Cadman, C. H., 2434
Čaĭlahjan, M. H., 780
Cain, J. C., 2267, 2268
Cairaschi, E. A., 372j, 2860, 2922d
Cairns, E. J., 474, 2740, 2741
Calavan, E. C., 789, 3053
California Department of Agriculture, 4465
Calle, H., 3269e
Calvert, A., 2166, 3430
Calvert, J., 1672
Camacho, E., 953
Camacho Morales, L. H., 4292
Camargo Mendes, H., 1989
Cambra, M., 3570
Cameron, A. E., 1835
Cameron, C., 969, 4368
Cameron, S. H., 742
Cameron Brown, C. A., 53
Cameroons Development Corporation, 2119b
Camp, A. F., 3019
Campbell, A. I., 111
Campos, J. D., 2078j
Campos, L., 797
Canada Department of Agriculture, Fruit and Vegetable Products Research Committee, 4466
Canada, Minister of Agriculture, 161, 246, 247, 654, 1037
Cangardel, H., 2914
Canham, A. E., 53
Canitano, D., 2347, 2663
Cannon, R. C., 942
Cannon, W. A., 3352
Cantelo, W. W., 1803
Canterbury Agricultural College, N.Z., 1061c
Capó, B. G., 3270k, 4447m
Capoor, S. P., 578, 615f
Capot, J., 599
Capreal, S. H., 4088
Capucci, C., 2367
Carag, A. T., 596
Carbonel, J. R., 919
Cardona, E., 4303
Carew, J., 405, 542d, 2808
Carilli, A., 1456
Carli, A., 2472, 2476
Carlone, R., 3530
Carlson, A. E., 3706
Carlson, R. F., 216, 1481, 2583, 2591
Carman, G. E., 4232
Carncross, J. W., 3908
Caro, D., 361
Carolus, R. L., 1481, 2745
Carpenter, W. J., 3007
Carr, D. J., 1145w
Carra, —., 1751
Carra, P., 2955
Carrante, V., 1271
Carré, J., 1982, 4328
Carreker, J. R., 415
Carrier, L. E., 695
Carstens, M. W., 3856
Carter, J. C., 4162c
Carvalho, A., 904, 909
Casarini, B., 1535, 3868
Casida, J. E., 3689d
Casimir, J., 2736
Cassidy, P. H., 4264d
Castaño A., J. J., 911, 1991, 3168, 4342
Castberg, C., 1220
Casteel, H. W., 3572s
Castillo, B. S., 4033, 4281
Castro, G. P., 600
Catel, W., 1213
Cathey, H. M., 640, 4089, 4111
Cation, D., 300, 304
Catlow, E., 165, 3555
Cavell, A. J., 2143
Cavill, G. W. K., 2208g
Cawthron Institute, New Zealand, 116, 510, 515, 544, 545, 604, 605, 606, 1038
Cederman, J. A., 4264e
Cehmistrenko, V. F., 2669
Čekotillo, A. M., 2315
Celjadinova, A. I., 593
Cerbulis, J., 3124
Černenko, E. S., 2261
Černjaev, I. P., 1189
Černyš, A. I., 1140
Cerós, A. P., 1413
Cerrini, U., 1236c, 3489
Ceruti, A., 2322c, 3879
Cessac, M., 3789
Ceylon Director of Agriculture, 833
Ceylon Rubber Research Institute, 948
Chacravarti, A. S., 4426
Chadwick, L. C., 2997
Chakrabarti, J. K., 4068f
Chakrabarty, M. M., 1911
Chakrabortty, H. C., 79g
Chakravarti, D., 1742d
Chakravarti, R. N., 1742d
Chakravarti, S. C., 1742d, 3358, 3719
Challenger, S., 4080
Chamberlain, E. E., 3590, 3594
Chamberlin, F. S., 3994

Chambers, J., 2435
Chamblee, D. S., 1780
Champignons, Centre de Recherches sur les, Gembloux, 2710
Champion, J., 849, 2078k
Chancogne, M., 2521, 2522
Chandler, B. V., 3075
Chandler, P. A., 2944
Chandler, S., 372k
Chandler, S. C., 316, 350
Chandler, S. E., 2899
Chandra, G., 2881
Chandra, V., 4012
Channa, O. N., 4015
Chao, Y-C., 3686
Chapman, H. D., 757, 3402
Chapman, P. J., 3626
Chapot, H., 832c, 1857, 3100g, 4264f
Chappell, W. E., 2594
Chappuis, E., 2199
Chardon, F., 4383
Charles, A., 1710
Charnot, A., 4220
Charon, —., 4162d
Charpentier, L. J., 4416
Charter, C. F., 1932
Chase, F. E., 159
Chase, J. L. H., 1647e
Chateau, R., 939
Chater, J. P., 4047
Chathukutty Nambiar, M., 4317
Chatt, E. M., 3274
Chatterjee, B. G., 558
Chaudhuri, R. H. N., 1712
Chavancy, A., 1725, 1909, 1916
Cheal, W. F., 1244, 1245, 1246
Cheshunt Experimental and Research Station, 445, 494, 629, 1061d
Chester, K. S., 1123
Chettiar, T. P. R., 899
Chevalier, A., 2322d, 2322e, 2901, 3100h
Chevassus, A., 1567
Chevrel, J., 372x
Chiapparini, G., 3539k
del Chiaro, G., 2819
Chibnall, A. C., 1574, 1575
Chicago, Library Branch, Quartermaster Food and Container Institute, 201k, 201l, 542v
Chichester, C. O., 3397
Child, R., 887, 1016k
Childers, N. F., 4453
Childs, J. F. L., 1912e
Childs, W. H., 356
Chilean Nitrate Educational Bureau, Inc., 3403
Chilton, S. J. P., 398, 3744, 4393, 4405
Chinloy, T., 4397
Chippendale, F., 3998
Chisholm, M. J., 1290, 1295c
Chládek, M., 1742e
Chollet, P., 1162
Chopinet, R., 1565
Chopra, I. C., 583, 588
Chopra, R. N., 1647f, 2838d
Chouard, P., 2907
Choudhari, B. L., 2011
Choudhri, B. L., 2078l
Choudhri, R. S., 477, 2771, 3924
Choudhury, D. K., 1911
Choudhury, J. K., 2890
Chow, N.-P., 1017s
Chowdhury, S., 3059
Christ, E. G., 1309, 2428, 3572c, 3572d
Christensen, B. E., 1145v
Christensen, E., 1094, 1095
Christensen, H., 3280
Christiansen, E., 3825
Christopher, E. P., 197, 198, 199
Chroboczek, E., 2750
Chu, H. T., 990
Chu, T. L., 966
Chupp, C., 542d
Churchward, J. G., 2069
Cibes, H. R., 1802
Ciccarone, A., 1360, 1633
Ciferri, F., 2410, 2780
Ciferri, R., 250, 253, 358, 482, 1310, 1596, 1902, 2440, 3672
Cilli, L. M., 4256
Cipolla, G., 807
Čirikov, Ju. F., 1626
Čirkovskiĭ, V. I., 1658
Čitašvili, S. Š., 3093
Clapier, B. A., 978
Clark, B. E., 2924, 3841
Clark, F., 1659
Clark, P. J., 2543, 2825
Clark, R. E., 1435j
Clark, R. R., 3554
Clark, T. F., 2321
Clarke, B. W., 2134
Clarke, W. S., Jr., 121
Clausen, R.-L., 1435d
Clayton, C. N., 1435p
Clayton, E. E., 555
Clements, H. F., 3213, 3222
Cleppa Park Horticulture Demonstration Station, 1063, 4479
Clopton, J. R., 1741
Clore, W. J., 390
Close, A. W., 2169
Cobb, R. D., 3759d
Cochran, L. C., 1329, 3593
Cochran, W. G., 3443e
The Cocoa, Chocolate and Confectionery Alliance, Ltd., 1932
Coconut Research Institute, Ceylon, 3142, 3269f
Coelho, J. M. N. S., 99
Coen, E., 3166
Coetzee, W. H. K., 1647g
Cohen, A., 784, 3045
Cohen, M., 1856
Cohic, F., 1016l
Coit, J. E., 832d
Colbran, R. C., 1368
Cole, J. R., 307, 2481
Coleman, R. E., 4373, 4423
Coles, J. V., 535
Colhoun, J., 1541, 3955i
Čolič, M., 3658
Collingwood, C. A., 4046
Collins, J. C., 1652
Collins, W. B., 2330
Collyer, E., 310, 1435e, 3629
Colmer, A. R., 1477
Colombia, Facultad de Agronomia, Palmira, 3311
Colombo, C., 1810
Colonial Products Advisory Bureau, 841, 842
Colthurst, J. P., 3955g
Comin, D., 2306
Comité National pour l'Étude de la Culture Fruitière, Belgique, 2213
Commercial Grower, 3275, 3321
Commoner, B., 1697e
Commonwealth Bureau of Plant Breeding and Genetics, 10
Commonwealth Dried Fruits Control Board, Australia, 1295b
Commonwealth Economic Committee, 1146, 1914, 2892
Commonwealth Institute of Biological Control, 2545d
Commonwealth Scientific and Industrial Research Organization, Australia, *see* C.S.I.R.O., Australia
Compagnon, P., 4446l
Comuzzi, A., 222
Congdon, N. B., 172, 1420
Congrès Pomologique de France, 3539f
Connecticut Agricultural Experiment Station, Storrs, 1061e
Connell, J. U., 3678
Connell, T. D., 4406
Connell, W. A., 364, 542e
Connor, J., 3041
Connors, C. H., 1793

Conroy, R. J., 451
Conseil des Academies de la R.P.F. de Yougoslavie, 3322
Constable, D. H., 1918
Constain, J. C., 871
Contois, D. E., 945
Cooil, B. J., 1923
Cook, A. S., 1016m
Cook, J., 2028
Cook, J. A., 806, 2779
Cook, J. B., 1881
Cook, R. L., 2949
Cooke, A. R., 2150
Cooke, G. W., 413, 2690
Cooke, N. E., 1216
Coolhaas, C., 1913
Coombe, B. G., 305, 1284
Cooper, D. R., 1698
Cooper, W. C., 3038, 3039
Cope, F. W., 859, 875, 1939, 1941, 1946, 2078m
Copley, T. L., 1665
Corbet, H. A., 4454
(Corbett, G.), 1653
Corbett, R. E., 1742f
Cordonnier, R., 3624
Corey, A. T., 1647h
Cornelius, J. A., 4068g
Cornell, P. W., 729, 735d
Corns, W. G., 489
Cornuz, L., 2993
(Corradini, V.), 1642
Corrales Macedo, A., 3955j
Correa, R. T., 2613, 2676
Correll, D. S., 1742g, 2080
Corsten, L. C. A., 79s
Cortes, R., 797
Cortvriendt, S. F., 1805
Cory, E. N., 4127
Cosmo, I., 222, 1256, 1257, 2359
Costa, A. S., 908, 4402
Costantino, G., 3642
Cota Galan, R., 2866
Cottier, E. F., 1485d
Couillaud, P., 1305, 1359
Coulter, L. L., 3716
Couraud, J., 2678
Courshee, R. J., 2201, 2536, 2537, 2538
Courtney, W. D., 2921
Coutan, —., 2641
Coutanceau, M., 3446
Coutant, R., 2281
Coveney, R. D., 4067
Cowgill, W. H., 4329
Cowley, W. R., 2973
Cox, J. A., 3572e, 3955k, 3956p
Cox, R. S.. 725, 3011f, 3870
C.P.V. Experiment Station, Indonesia, 3318
Cradock, F., 1508
Craft, C. C., 2832
Crafts, A. S., 1440, 2549, 3698, 3700
Craig, D. L., 207
Crandall, P. C., 2338
Crandall, P. R., 3100p
Crane, F. L., 2792, 3913
Crane, H. L., 239, 3095
Crane, J. C., 185, 901, 2264, 2295
Crang, A., 218, 408
Crawford, C. L., 2693, 2694
Crawford, D. E., 1649
Cree, C. B., 832i, 1912h, 3042
(Creech, J. L.), 2170
Crellana, R. G., 1958
Crescimanno, F. G., 237, 4183
Crescini, F., 404a
Cressman, A. W., 1398, 3064, 4235, 4236
(Crider, F. J.), 4122
Crnčević, V., 3537
Crnko, J., 1727
Crocker, C., 543d
Crofts, F. C., 3847
Crombie, W. M. L., 4099
Crop Reporting Board, U.S.A., 577d
Cropley, R., 3589, 3600
Crossan, D. F., 453
Crosse, J. E., 3602
Crossley, J. H., 655
Crouse, R. H., 1697f
Crowe, L. K., 3451
Crowley, N. C., 3955l
Crowther, P. C., 4446m
Croxall, H. E., 1539
Cruickshank, D. H., 3443n
Cruickshank, I. A. M., 2755
Cruickshank, J. A., 3715
da Cruz, H. M., 1957
Cruz, P. I., 4031
Cruzado, H. J., 386, 1447, 1459
C.S.I.R.O., Australia, 135, 195, 235, 382, 546, 758, 1039, 3445, 3517, 3567, 3697, 3718, 3783, 3785, 3909, 3957, 4064, 4467
Cuatrecasas, J., 3269g
Cuccia, C., 1258, 1267
Cuénod, A., 3347
Cuenot, G., 4192
Cueto Robayna, C. B., 3223
Culaja, V. I., 1821
Cumber, R. A., 1723, 4034, 4035, 4036
Cumberland, R., 244a
Cunene Experiment Station, 3299
Curl, A. L., 4264g
Currence, T. M., 2838e
Curtis, C. H., 809
Curtis, J. D., 1801
Curtis, J. T., 4162e
Cutright, C. R., 329
Cutter, V. M., Jr., 3269h
Cutter, Y., 3054
Cuvier, P., 3179
Cuzin, J., 3968
Cyprus, Agricultural Research Officer, 2098
Cyprus, Tobacco Officer, 1653
Czaja, A. T., 3431

DaCosta, G. C., 2682
Dadant, R., 3148, 3165
Dadd, C. V., 2690
Dahlmeyer, W. H. M., 2499
Daines, R. H., 2516
Dakers, J. S., 1061a
Dalberg, L. Y., 3384
Dale, W. T., 876, 1939, 3950
Dallyn, S., 379
Dalrymple, J. L., 3978
Daly, J. M., 3362
D'Amato, F., 461
Danielson, L. L., 2560, 2601
Danish Plant Service for Seed Pathology, 1061f
Danish Seed Testing Station, 1061g, 3323d
Danon, M., 1611
Dansk Gartnerforening, 3276
(Danvig, A. M.), 3276
Darby, J. F., 3932
Darley, E. F., 45, 1082, 1083, 1085
Darpoux, H., 2545e
Darrow, G. M., 1250, 2323, 2332
Darrow, R. A., 1485e
Das, B. M., 1740, 4068o
D[as], G. M., 3269i, 3269j
Date, W. B., 190, 3521
Datta, R. M., 3011g, 3269k
Daudin, J., 1929
Dauple, —., 2641
Davel, H. B., 3021
David, W. A. L., 3901
Davidson, J. H., 2343
Davidson, L. G., 2063, 4382
Davidson, O. W., 4073
Davidson, R. H., 4095
Davidson, R. W., 2448
Davies, D. A., 3423
Davies, E. de L., 3164
Davies, G. E., 3486
Davies, J. N., 52, 542f, 2644
Daviknes, T. B., 2759
Davis, C. S., 2493, 3637
Davis, C. W., 1236b
Davis, D., 3941
Davis, E. W., 2804
Davis, J. R., 1128
Davis, L. H., 1754, 2953
Davis, T. A., 891, 3269l, 3269m, 4314
Davison, B. K., 1016n
Davison, J. R., 832e, 3017

Dawe, T. C. R., 3884
Dawson, E. H., 425, 3682
Dawson, R. B., 394, 3277, 3759e, 4494a
Day, B. E., 385, 2559, 2565
Day, P. R., 3939
Dayton, D. F., 2545f, 2545p
De, R., 4379
Dean, F. P., 330, 2486
Dean, H. A., 3065, 4264h
Dean, L. A., 3043
Deanon, J. R., Jr., 582
DeCaprio, A., 3633
Decastro, V., 2000
Deen, O. T., 3864
Deetlefs, J. du T., 4246
DeFrance, J. A., 2585, 2586
DeGarmo, E. P., 2200
Degman, E. S., 2272
Deĭmontovič, B. I., 1670
Dekker, P., 3330, 3539g
Delanoue, P., 3791, 3839
Delhi, Dominion Experimental Station, Ontario, 3958
Delmas, E., 1121
Delmas, H.-G., 296, 2255, 3789
Delmas, J., 2719, 3873
Delp, C. J., 372o
Delphey, C. C., 4176
Delver, P., 50
Dementjeva, M. I., 1351
Demoranville, I. E., 181
Dempsey, A. H., 538
Denham, G. C., 4428
Denisen, E. L., 388, 2338, 2342
Dennison, A. C., 4068q
Dennison, R. A., 2689
Derard, J., 313
Dermen, H., 136
Dermine, A., 3579
Dermine, E., 101, 126, 2269, 3457
Dermott, W., 542g, 1236d, 2395b
Desgraz, A., 1150
Deshpande, B. D., 658
Desrosier, N. W., 183, 1646
Deszyck, E. J., 3049, 4193, 4215
Detroux, L., 343, 2606, 3583
Deuel, H., 3409
Deutsche Akademie der Landwirtschaftswissenschaften, 2117
Deutschmann, F., 1354, 4068h
Devjatov, A. S., 1175, 2257
(Devonshire, C. R.), 3749
Devuyst, A., 928, 3269n
Dewey, A. W., 3011h
Dewey, D. H., 186, 187, 188
DeWolfe, T. A., 1864, 3066
DeZeeuw, D. J., 459
Dg, 1647i
Dible, W. T., 2208h
Dicarlo, F. J., 1017a
Dick, J., 2060
Dicker, G. H. L., 339, 3689e
Dickert, H. W., 2457
Dickey, R. D., 1795, 4117
Diener, V. L., 3955m
Diercks, R., 372m
Dieter, C. E., 1519
Diffidenti, G. H., 586
Dignadice, P. B., 4403
van Dijk, P. J. S., 715
Dijkman, M. J., 4013
Dijksterhuis, H. P., 1341, 2451, 2545s
van Dillewijn, C., 3235
Dimock, A. W., 647, 4091
Dimond, A. E., 1639, 1640, 2545g
Dini, M., 2789
Dinkla, P. E., 2208t
van Dinther, J. B. M., 1584, 3690p
Dios Vidal, R., 3778
Diry, —., 2348
Ditman, L. P., 1582
Djadjučenko, P. M., 3970
Dlinka, A. D., 3770
Dobelmann, J.-P., 4038
Dobrovoljskiĭ, A. N., 2395c
Dobrovsky, T. M., 3817
Dodge, C. W., 2917
Doehlert, C. H., 2545h
Doepel, R. F., 1637
Doidge, E. M., 245
Dolan, D. D., 2605
Doll, C. C., 2338
Domangue, D. A., 3742
Domato, J., 1824, 1832
Dominica Department of Agriculture, 3323e, 4494c
Dominick, B. A., Jr., 1232
Dominick, C. B., 3992
Donadoni, S., 2864, 4000
Donno, G., 102, 103, 104, 141
Doolittle, S. P., 518
Doorenbos, J., 79h, 641, 716, 1090, 2174, 2956
van Doorn, A. M., 2756, 2757, 3882
Dore, J., 1091
Dormal, S., 3681
Dormer, K. J., 1568
Doroszewski, M., 542h
Dorsman, C., 706
Dosse, G., 439
Doucette, C. F., 682, 3011i
Doutt, R. L., 827, 4262
Dovgopolyĭ, G., 1498
Downie, W. A., 4338
Dragaš, M., 227, 3558, 3563
Dragavcev, A. P., 3449
Drake, R. J., 832u, 1816
Drake, R. M., 1465
Dreibrodt, L., 2637
Drezgić, P., 56
Dried Fruit Processing Committee, 3535
Dropkin, V. H., 2829
Drouillon, R., 4325
Drouzy, J., 1565
D.S.I.R., New Zealand, 604, 2099
Duain Moore, J., 3689c
(Duarte, O.), 4291
Ducet, G., 3806
DuCharme, E. P., 1865, 3016
Duddington, C. L., 2830
Dufournet, R., 1016o
Dugger, W. M., Jr., 30, 40
Dühr, —., 2380
van Duin, R. H. A., 2195
Duisberg, P., 2868
Dukeshire, N. W., 1855, 3100f
Dulac, J., 820, 1900
Dumas, —., 1425
Dumas, M., 201c
Dun, G. S., 1976
Dunbar, C. O., 1165
Duncan, A. A., 3733
Duncan, C. W., 2838g
Dunegan, J. C., 281, 357, 372 l, 372v, 2442, 3689f
Dunlap, V. C., 850, 1017r
Dunn, J. S., 420
Dupaigne, P., 542i, 2014
Duperrex, A., 1813e
Duque, J. G., 3278
Durbin, R. D., 1435f
Durocher-Yvon, F., 1016p
Dürr, H. J. R., 3684
Duruz, W. P., 1992
Duthie, D. W., 594, 1917
Dutt, J. O., 2838f
Dutt, N. L., 3743
Dutta, S., 3170
D[utta], S. K., 3256, 3258, 3263, 3269q
van Duuren, B. L., 615a, 615b
Duynhouwer, D. J., 1913
Dvori, A., 753
Dvornikova, Z. V., 3770
Dwarkanath, C. T., 4446x
Dwyer, R. E. P., 1973
Dye, D. W., 298, 2447, 2822, 3664
Dye, M. H., 3664, 3665
Džorbenadze, A. M., 3023

Ealy, R. P., 1747
Easley, L. W., 2560
East Africa High Commission, 2900, 3323f
East Malling Research Station, 4468
Eastwell, B. A., 2208i
Eastwood, T., 392, 2582
Eaton, E. L., 202

Eaves, C. A., 196, 1210, 3522, 3526, 3527
Ebben, M. H., 528
Ebeling, W., 365, 454, 832f
Eberhardt, F., 2168
Eberhardt, G., 2208j
Echeverri, H., 2027
Eddins, A. H., 1536
Eden, D. R. A., 1932
Eden, T., 1000, 1917, 2072, 3250
Edge, E. D., 3501, 3525, 3824
Edgerton, L. J., 2294, 2369
Edland, H., 1061a
Edwards, B. A. B., 1875
Edwards, C. A., 3851
Edwards, C. R., 3759c
Edwards, R., 160
Edwards, R. I., 2799
Edwards, R. L., 2726, 2728, 2729, 2735, 2838g
Efeĭkin, A. K., 3920
Efford Experimental Horticulture Station, Hants., 4479
Eggenberger, W., 231
Eggert, F. P., 2225
Eggman, L., 1145e
Ehrenhardt, H., 320, 336, 372m, 3955n
Ehrle, L., 65
Eide, C. J., 2838e
(Eidg. Statistisches Amt, Bern), 2212
Eifler, I., 79n
van Eimern, J., 264, 1315
Eisses, J., 614
Elandt, R., 1145f
Elant, H., 4264i
Elern, S. J., 404b
Elgin, N., 1697g
Ellenwood, C. W., 201d
Ellingham, G., 192
Ellis, D. E., 453, 1647j
Elmer, H. S., 796, 798
Elmore, J. C., 3954
Eloja, A. L., 3746
El-Tomi, A. L., 4264j
Elzenga, G., 4020
Embleton, T. W., 3035
van Emden, J. H., 959, 2164
Emerson, F. H., 289
Emery, G. A., 4045
Emiliani, G., 1360
d'Emmerez de Charmoy, D., 967
Emmert, F. H., 2231, 3514
Emond, R. E., 3735
Emparan, P. R., 4056
Endemann, W., 559
Enderud, J., 3012, 3100v, 3100w
Endrigkeit, A., 2665, 3955o
Engel, R. E., 2587
Engelbrecht, D. J., 1335
Engels, L., 2737, 2738
English, A. R., 1114
English, H., 1355
English, R. D., 2322f
English, W. S., 1400
Enikeff, —., 163, 164, 781
Ennis, W. B., Jr., 1451
Enoch, A., 1016q
Entomological Branch, N.S.W. Department of Agriculture, 1387, 1411, 1644, 1647w
Enzor, J. K., Jr., 1839
Epling, C., 4162n
Erakman, K., 1663
Erasmus, J. C., 1742h
Ergesjan, R. A., 1270
Erickson, A. E., 2949
Erickson, L. C., 760, 3047, 3725
Ernst, A., 735f
Ernst, E., 2418, 2748, 3795
Ervin, J. O., 3029
Erygina, N. P., 1281
Escalante, M. G., 2922e
Eschenwald, A., 4334
Eschrich, W., 1813f
Escritt, J. R., 2589, 2974
van Essen, W. J., 2034
Esteves-de-Sousa, A., 4128
Eteneau, J., 4211
Ethirajam, A. S., 2078n
European Plant Protection Organization [EPPO], 1080, 2487, 3689g, 3689h, 4494d
Evans, C. D., 3765
Evans, G., 2025
Evans, H., 861, 866, 867, 868, 1951
Evans, H. J., 517
Evans, W. D., 1320
Evenari, M., 416, 1614, 1615, 2776
Evers, E., 1016r, 4358, 4446n
Evesque, J. M., 3572j
Evreinoff, V.-A., 1236e, 1288, 2235, 3572f
Ewart, M. H., 1811
Ewart, W. H., 796, 798
Eyring, H., 3361

Fabig, F., 502
Faccioli, F., 3494
de Faestraets, L., 2606
Fahn, A., 846
Fairfield Experimental Horticulture Station, 4479
Faivre, M., 1312
Fajardo, P. S., 431, 1531
Falch, J., 209, 1200
Faljkenšteĭn, B. Ju., 351
Falk, K., 660, 1647k, 1647 l, 4132, 4133
Fanshawe, D. B., 4014
Fardy, A., 3968
Farmer, A., 1182, 3472
Farooq, M. O., 542j
Farr, T. H., 16
Farrar, R. F., 4040
Fast, G., 2185
Faust, J., 3689i
Faure, J., 83
Favre, C., 3577
Fazlullah Khan, K., 3264
Federer, W. T., 3344
Federico, L., 3782
Fedorinčik, N. S., 1861
Fedotova, A. L., 3955p
Fehleisen, S., 4131
Feigin, Ya. G., 4449
Feinbrun, N., 2957
Felber, G. W., 3564
Feldmeier, I., 79i
Felius, P. M., 1090
Félix, L., 2681
Fennah, R. G., 867, 1950
Ferguson, J., 543b, 1758
Ferguson, W., 3755, 3759f
Fernandez-Cano, L. H., 228
Fernando, L. H., 2886
Fernqvist, I., 2545i
Fero, 201e
Ferraz, M. de B., 4335
Ferreira Filho, J. C., 902
Ferrer, L. G., 3972
Ferwerda, F. P., 3154
Ferwerda, J. D., 4352
(Feuell, A. J.), 4050
Fici, P., 1259
Fidel Castro, M., 2078o
Fielding, A. H., 291
Fiero, G. W., 3675
de Figueiredo, E. R., Jr., 735g, 1818
Filho, H. A., 909
Filinger, G. A., 2245
Filipek, H., 2675
Filocamo, E. F., 373c
Fink, H. C., 2962
Finney, D. J., 1021, 3345
Fiori, G., 3090
Fischer, A., 2208k
Fischer, C., 621
Fischer, C. W., Jr., 4162w
Fischer, M., 3653
Fischer, R., 1348
Fisher, D. E., 3940
Fisher, D. V., 178, 1222, 3501, 3519, 3525, 3539h, 3824
Fisher, E. E., 3618
Fisher, F. J. F., 1137
Fiskel, J. G. A., 3927
Fjäderhane, A. M., 7, 1746
Fjelddalen, J., 2491, 2759
Flaig, W., 2158
Flegg, P. B., 2726, 2734
Fleming, H. K., 1248

Fleming, W. E., 2653
Fleschner, C. A., 752, 4264k, 4264 l
Fletcher, R. F., 2607, 2838f
Fletcher, W. A., 3072
Flint, H. L., 2948
Flippin, R. S., 3117
Flock, R. A., 3659
Floor, J., 2204
Florenchie, —., 1751
Flores A., M. A., 2054
Floriani, F., 201f
Florida Agricultural Experiment Stations, 2101
de Fluiter, H. J., 275
Folckemer, F. B., 1435g
Foley, F. B., 2650, 3871
Folley, R. R. W., 201g, 2218
Follwell, J. H., 1375
da Fonseca, J. C., 4227
Food and Agriculture Organization of the United Nations [FAO], 1073, 1074, 1075, 2100, 3323g, 3573, 4469, 4470
Forbes, A. G., 3689a
Ford, D. L., 2208g
Ford, E., 2078p
Ford, H. W., 790, 4186, 4202
Forester, M. B., 2395d
Forestry Commission, 3689j
Forrest, L. A., 1665
Fors, A. L., 3207, 3219
Forsberg, J. L., 665, 4107
Forsee, W. T., Jr., 3925, 3927
Forshey, C. G., 2259
Forster, W. A., 11, 12
Forsyth, W. G. C., 1966
Fort William District Experiment Substation, Ontario, 2102
Forti, G., 3114
Fortún, C. M., 3241
Fosen, E. H., 1398
Foskett, R. L., 2752
Fossum, M. T., 2127
Foster, R. E., 542b
Foster, Z. C., 63, 2077
Fouarge, E., 4075
Fouarge, M., 2797, 2798
Foucart, G., 3169, 4051, 4310
Fouqué, A., 3112
Fourmont, R., 1566
Fox, C. J. S., 542k, 1697h
Fox, J. M., 233
Fraga, C. A., 1017p
France, V. A., 2601
Francesconi, F., 815, 1896, 4264m
Franck, J.-P., 4290
Franco, C. M., 1989
Franco, E., 897
Franco-Bétancourt, J. J., 2078q
Francot, P., 2395e
Frank, F. A., 615k
Frankenburg, W. G., 1691
Franklin, D. F., 3955w
Franklin, M. T., 372i
Frans, R. E., 2556
Fransen, J. J., 3818
Franssen, C. J. H., 540, 542 l, 898, 3853, 3854
Franz, J., 372n, 3689k
Frappa, C., 4311
Fraselle, J. V., 1995
Fraser, I. M., 1590
Frazier, N. W., 2436, 2437
Freed, S., 1145s
Freed, V. H., 2597, 3694, 3759g
Freeman, B., 3269h
Freeman, G. H., 2131
Freeman, J. A., 2985
Freeport Sulphur Company, 4455
Freitag, J. H., 2437
Frémond, Y., 4312
French, F. L., 551
Frenkel, A. W., 3360
Frézal, P., 2348
Friedrich, G., 1236f, 2251
Friend, J. N., 1513
Friesdorf Bad Godesberg Gärtnerische Versuchsanstalt, 1744
Fritsche, —., 498
Fritz, D., 3917
Fritzsche, R., 3581
Frohner, W., 3713
Frolich, E., 3034
Frolich, E. F., 736
Frömming, E., 1061 l
Fronmuller, W. A., 2981
Frost, H. B., 2952
Frost, K. R., 1130
Frost, O. M., 82
(Fruhstorfer, A.), 620
Frylink, A., 4116
Fudge, O. L., 2574
Fujii, T., 2252, 3955q
Fukunaga, E. T., 810, 2704
Fukuto, T. R., 3685, 3689x
Fuller, C. E. K., 244b, 2996
Fulling, E. H., 1716, 4068i
Fullmer, F. S., 4195
Fulton, R. E., Jr., 4244
Fulton, R. H., 277, 304
Funk, G. L., 3707
Furneaux, B. S., 3443f
Furr, J. R., 806
Furuta, T., 643
Fuss, F., 2418

Gaarder, P., 3011j
(Gabelman, W. H.), 1601
Gabrielsen, E. K., 2208 l
Gabryl, T., 2750
Gac, A., 3569
Gaden, E. L., Jr., 4249
Gagnard, J., 2385
Gagnotto, A.-V., 671
Galbraith, W. S., 1588
Gallatin, M. H., 4166
Gallay, R., 279, 1044, 1255
Gallo, D., 4414
Galston, A. W., 29, 3273, 3384
Galt, 931
Galzy, P., 3572j
Gambrell, F. L., 3641
Gambrill, R. G., 3628, 3689v
Gammon, C., 3651
Gammon, E. T., 4147
Gammon, N., Jr., 256, 1291, 1800, 2387, 3807
Gandy, D. G., 2838g
Gangolly, S. R., 894, 4317
Gangstad, E. O., 395, 603, 1726
Garangeat, S., 4264n
Garayar M., H., 4196
García Becerra, C., 3120, 3134, 3135, 3138, 3269o, 4287, 4293
Garcia, G. M., 3883
Garcia Mendez, J. B., 4364
Gard, L. N., 380
Gardener, J., 3759h
Gardiner, B. O. C., 3901
Gardner, C. A., 735h, 735i
Gardner, H. W., 3279
(Gardner, V. R.), 1309
Garinei, D., 2864
Garland, H. L., 2040
Garman, P., 3631, 3633, 3669, 3670
Garmus, R. D., 3659
Garner, H. V., 3279
Garner, R. J., 1177, 3462, 3478
Garrard, A., 1576
Garren, K. H., 3001
Garren, R., 2695
Garren, R., Jr., 1756
Garretsen, F., 211
Garriss, H. R., 1697i
Gärtel, W., 2404
Gartenbauwissenschaft, 4492
Garthwaite, J. M., 1537, 1743
Gaspar, M., 577f
Gassner, G., 1774
Gast, A., 2500, 2947n
Gauch, H. G., 30, 40
Gaudineau, M., 306, 2452
Gäumann, E., 2148, 3410
Gaur, B. K., 3924
Gausman, H. W., 2613, 2676, 2973, 3037, 3100q
Gauthier, A., 1071
Gavrilkevič, B. B., 2368
Gavrilović, M., 3580
Gayford, G. W., 1149, 3469
Gedeon, J., 4068j
Gedroyć, H., 3740
Geelen, T. E. J. M., 1350

Gehring, F., 2838h
Geier, P., 332, 333, 334, 1391
Geisenheim, *see* Bundesanstalt, *and* Lehr- und Forschungsanstalt
Geissler, G., 3373
Geissler, T., 1501, 3828
Geissman, T. A., 2208m, 2950
van Geit, P., 2545j
Gelin, O. E. V., 3842
Geljfandrein, P. S., 2300
Geloso, A., 3878
Geoffrion, J.-M., 4086
George, D. K., 2621b
George, E. J., 1324
Georghiou, G. P., 4231
Georgia Experiment Station, 4494e
Georlette, R., 79j, 2322g
Geraldson, C. M., 1546, 1634, 3823, 4106
Gerasimova-Navašina, E. N., 1742o
(Gerhardt, F.), 1227
Gerhardt, P. D., 3661, 4228
Gericke, S., 2208n
Germek, E., 79k
Gerritsen, J. D., 215, 244c, 1163
Gerstel, D. U., 1742i
Gertych, Z., 1198
Gesell, S. G., 2986
Gibberd, A. V., 1932, 2084
Gibberd, V. L., 2084
Gibbs, M., 2167
Gibson, H. V., 4121
Giesberger, G., 996
Gifford, J. C., 2621c
Gigante, R., 569, 1317, 2858
Giggard, E. D., 542t
Gilbert, J. C., 542m
Gillard, S. O., 79q, 406
Gillespie, H. L., 832g, 4165
Gillham, E. M., 542n
Gilmer, R. M., 3599
Gilmour, J. S. L., 1145g, 1145h
Gilpin, G. L., 3682
van Gils, G. E., 2030
Ginsburg, L., 2017
Giordano, B., 1262
Giori, G., 2220
Giovagnotti, C., 2847
Giovannini, E., 2317, 3406
Giovannozzi, M., 2849
Giraldi, G., 826
del Giudice, E., 2357
Gjaerum, H. B., 2460
Gjems, O., 3443g
Gleisberg, W., 4007, 4492
Glendening, G. E., 2580
Glendenning, R., 355
Glenn, K., 3025
Glonti, M. D., 2125
Glover, J., 2189, 2900
Glover, P. M., 3254, 3256, 3258, 3261, 3262, 3263, 3269p, 3269q
Gloyne, R. W., 791
Gobbato, C., 2355
Godchaux, L., 1485f
Godfrey, G. H., 785
Godoy, C., Jr., 4344
Godwin, A. E., 436
Goetsch, W., 2786
Goguadze, M. N., 1390
Gokhale, N. G., 3269r, 4427
Gold Coast Department of Agriculture, 2103
Golden, A. M., 651, 4146
Goldstein, C., 882
Goldstein, H. L., 16
Goldweber, S., 4214
Golodriga, P. Ja., 3559
Gomes, F. P., 3346
Gómez Alvarez, F., 4387
Gómez, S. A., 4068k
Gondo, M., 3983
González, C. A., 1988
González-Mendoza, R., 4345
González Ríos, P., 3269s, 4446o
Goodall, G. E., 743, 747
Goode, J. E., 3443h
Goodman, O., 3890
Goodman, R. N., 1333, 2441
Goodwin, R. H., 3443i
Goor, A., 813
Gorbatjuk, D. A., 2283
Gorbatov, P. P., 1141
Gordon, A., 982
Gordon, S. A., 3378
Gorenz, A. M., 3195
Gorjačeva, E. P., 3656
Gorlenko, M. V., 1298
Gortner, W. A., 381
Gossweiler, J., 3103
Gothoskar, S. S., 525
Gould, C. J., 674, 2968
Govaert, F., 4048
Govi, G., 3616
Govindachari, T. R., 4446p
Govindan, P. R., 516
Gow, P. L., 4276
van der Graaf, A. J., 374
Graham, B. F., Jr., 3398
Graham, S. O., 1172, 3463
Graham, T. W., 309, 2648, 3991
Grandori, R., 1522
Graner, E. A., 4326
Granhall, I., 1154, 2226, 2230, 2232, 3452
Graniti, A., 1332, 2474, 2545k, 4257
Granits, J., 3937
Grant, P. J., 4160
Grant, T. J., 4223
Gray, H. E., 1517
Gray, S. G., 4063
Greathead, A. S., 3790
de Greeff, H. J., 4289
Green, H. B., 3634
Green, K. R., 3693, 3759h
Green, M. E., 3809
Green, V. E., Jr., 2202
Greene, L., 901
Greene, R. E. L., 1489
Greenham, C. G., 2155
Greenham, D. W. P., 3739
Greenleaf, W. H., 1635
Greenway, P. J., 2007
Gregory, F. G., 79m, 3443j
Gregory, L. E., 953
Grekowicz, M., 1591
Grène, G., 3721
Greulach, V. A., 1145i, 1145j, 2153
Griemsmann, —., 1397
Grierson, W., 804, 4242
Griesel, W. O., 4154
Griffin, J. F., Jr., 4162f
Griffing, B., 531
Griffiths, A., Jr., 1795, 1800
Griffiths, F. P., 3100i
Griffiths, J. T., 1839, 1872, 4219
Griggs, W. H., 128, 2208o
Grigorovič, A. F., 3814
Grigsby, B. H., 1481
Grill, F., 1295d, 2208p
Grillot, G., 2909
Grindley, D. N., 4062
Grindrod, J., 3532
Griot, M. A., 331
Grison, P., 2522, 3667
Grogan, F. O., 888
Grogan, R. G., 520
de Groote, R., 618, 1805
Gross, C. R., 2276
Gross, R. A., 3269t
Grossenbacher, F., 1499
Groszmann, H. M., 4004
Groven, I., 3280
Groven, J., 203
Grubb, N. H., 3544
Grümmer, G., 24
Grütz, W., 3780, 3906, 3907
Guagliumi, P., 4418, 4421
Guba, E. F., 2463
Gude, C. J., 3160
Guenther, E., 4022
Guernsey, F. S., 511, 1630, 2157, 3845
Guha, P. C., 2078f
Guillé, J., 1928
Guillermo, R. J., 2046
Guillot, R., 3572g
Guinard, A., 1916, 1981, 2066, 2067
Guiochon, P., 2718
Gulińska, M., 2675

Gulval Experimental Station, 2104
Gümmer, G., 691
Gunckel, J. E., 1096
Gunn, J. S., 1917
Gunn, J. T., 1883
Gunther, F. A., 1878, 3100o
Gupta, B. D., 993
Gupta, G. N., 2881
Gupta, S. C., 1742j
Gurdián Morales, M., 2078r
Gurgel, J. T. A., 2911
Gurlev, A. S., 455, 3830
Guščin, M. F., 3490
Guseva, A. R., 1733, 4055
Guthrie, F. E., 3993
Gutiérrez Z., G., 3162
Gutnikova, Z. I., 2871
v. Guttenberg, H., 28, 79i, 79n
Gutter, Y., 832p, 1888
Guyot, H., 1924, 3112
Guzmán, V. L., 751
Gwynne, D. C., 1539

Haag, H. B., 2526
Haak, A. H., 1913
de Haan-Homans, L. N. S., 2031
Haarer, A. E., 4027, 4446q, 4446r
van Haarlem, J. R., 3511, 3538
Haas, A. R. C., 738, 741, 745, 748, 777, 3014, 3027, 3028, 3036, 4167, 4169, 4170, 4177, 4178, 4197, 4204
de Haas, P. G., 2217
Haasis, F. A., 453, 675, 1771
Haber, E. S., 3343
Habran, R., 3550
Hačatrjan, S. S., 1273
Hack, J., 523
Hackett, D. P., 1145k
Haenel, H., 3828
Haesloop, J. G., 2153
Haeussler, G. J., 2649, 2758
Häfliger, E., 2528
van Haga, P. R., 2922f
Hagedorn, D. J., 457, 3843, 3848
Hagiya, K., 2766
Hahn, E., 3646
Hahn, P., 1529, 2838i
Haiek, I., 4441
Halabuda, L. P., 1155
Hale, E., 2489
Hale, S. L., 1933
Halevy, Z., 668
Hall, C. B., 2809
Hall, E. G., 1223, 1225, 1226, 1231, 4245
Hall, G. D., 946
Hall, J. A., 2554
Hall, N. S., 1667
Hall, W. C., 1628
Hallbauer, E., 2180
Haller, M. H., 294, 3615
Halliday, W. G., 633
Hallock, H. C., 3864
Hallowell, C. K., 4123
Halma, F. F., 736, 743, 1817, 4164, 4173, 4175
Hamashima, N., 475, 2661
Hamdi, S., 509
Hamilton, C. C., 710
Hamilton, D. W., 344
Hamilton, J., 2373
Hamilton, R. A., 810, 2009, 3269u, 4253, 4264o, 4265a, 4353
Hamilton, R. H., 1485g
Hamlyn, B. M. G., 3810
Hammar, H. E., 2386
Hammarlund, A., 404e
Hammond, B. L., 1742i
Hammond, D. H., 1178
Hammond, P. S., 1932
Hamner, C. L., 1788, 2149, 2206, 2621g
Hance, F. E., 3759i
Hanchey, R. H., 3572e
Hand, D. B., 2838j
Handa, K. L., 583, 588, 4015
Hanger, F. E. W., 733, 1794
Hanger, W. G., 1742f
Hanna, A. D., 3132
Hannay, J. W., 1116
Hänsel, H., 2685, 3955r
Hansen, E., 190, 1145v, 3521
Hanson, J. B., 21, 3910
Harcourt, D. G., 1552
Hard, M. M., 1431, 2524
Hardcastle, A. E., Jr., 404c
Hardcastle, W. S., 1476, 3744
Hardenburg, R. E., 487, 3819
Harder, R., 691, 692, 2208q
Harding, P. L., 786, 1847
Harding, R. B., 519, 757, 768, 772, 1837
Hardman, J. A., 2545l
Hardy, F., 857, 872, 1939
Hardy, R., 3104
Hare, W. W., 541
Hargreaves, D. B., 4121
Hargreaves, G. H., 3269v
Haritonova, E. N., 1157
Harkness, B., 4162g
Harmon, F. N., 2365
Harrington, J. F., 3893
Harris, C. D., 4449
Harris, G., 607
Harris, J., 1780
Harris, N. L., 167
Harris, R. J., 1945
Harris, R. V., 609, 4068l
Harris, R. W., 184
Harris, W. D., 2545m
Harrison, B. J., 2632
Harrison, C. J., 3246
(Harrison, C. M. D.), 2900
Harrison, H. C., 1507
Harrison, R. A., 3884
Harrison, T. B., 3673
Harry, J. B., 3708
Hart, S. A., 638
Hartley, G. S., 2525
Hartmair, V., 1488, 2381
Hartman-Dröge, C., 4102
Hartmann, A., 2305
Hartmann, H. T., 811, 821, 3078, 3080
Hartree, E. F., 3443l
Hartzell, A., 1750, 3788
Haskell, G., 1197, 1621
Haskell, T., 4142
Haskew, H. C., 977, 3201
Hassan, H. H., 3914
Hatcher, E. S. J., 3462
Hatipov, A. E., 1167
Hatipov, S. E., 1167
Hattingen, R., 1808
Haude, W., 3443k
Hauge, A., 735j
Hauser, E., 2730, 2739
Hauser, E. W., 3722
Hauville, A., 814
Haviland, E. E., 4127
(Havis, A. L.), 1206
Havis, J. R., 399, 3153
Havord, G., 864, 865, 1939, 1948, 4295
Hawaiian Sugar Planters' Association, 2035, 2048, 2049, 2051
Hawks, S. N., Jr., 1445
Haworth, F., 873, 1005, 1016s, 3776
Hawthorne, P. L., 2462
Hay, J. R., 2578
Hayashi, K., 1530
Hayman, G. R., 550
Haynes, H. L., 3627
Hayslip, N. C., 1648h, 3925
Hayter, C. N., 3955s
Hayward, H. E., 153
Healey, A. G., 79o
(Healy, M. J.), 4050
Heaton, E. K., 2388
Hébert, J. B., 4271
Hebert, L. P., 1474
Heggli, M., 2545n
Heimann, H., 1906
Heimlich, G., 2307
Hein, A., 3689l
Heinemann, P., 2711, 2736, 2738
Heinisch, K. F., 3191
Heinze, P. H., 2832, 3368, 3915
Heiser, C. B., Jr., 537
Hellmers, E., 1760
Hellyer, A. G. L., 1022, 1040, 1061h, 4456
Helmkamp, G. K., 3689m

Hemphill, D. D., 2287, 2441
Henbest, H. B., 1108
Henderson, D. M., 1597
Hendrickson, R., 1889
Hendrix, J. W., 1325
Hengl, R., 3562
Henriksen, A., 2838k, 3825
Henry, P., 1016t
Henze, R. E., 200, 1229
Herbert, F. B., 1454
Herbert, L. P., 4389
Heredia Luna, S., 1832
Herfs, A., 1379
Herklots, G. A. C., 1813g
Hernández-Medina, E., 944
Herre, H., 4161
Herrmann, —., 513
Hertgers, J., 1435h
Herzfeld, E. W., 1912f
Hess, H., 2922g
Hesse, C. O., 4452
Heuberger, J. W., 280
van Heusden, W. C., 1016u, 4272
Hewetson, F. N., 152
Hewitt, E. J., 47, 434, 466, 2763, 3401, 3806, 3929
Hewitt, W. B., 3720, 3689n, 3689o
Hey, G. H. L., 1607
Hey, G. L., 3620
van der Heyden, S. J., 2208t
Heymann-Herschberg, L., 767, 773, 3033
Hibberd, N. V., 2683
Hicock, H. W., 3442
Hield, H. Z., 4264z
Hiemeleers, J., 134
Highkin, H. R., 3910
Hilbert, G. E., 1055
Hilborn, M. T., 302, 2459, 2517
Hild, G., 2716
Hildebrand, E. M., 2430, 2838 l, 3596, 3689p
Hildebrandt, A. C., 3374
Hildebrandt, H. J., 3775
Hilkenbäumer, F., 191, 3479, 3488
Hill, A. C., 412
Hill, E. C., 3074
Hill, G. D., 1484
Hill, H., 3528
Hill, R., 3443 l
Hill, R. G., Jr., 389, 1295e
Hiller, W., 2162
Hill-Lewis, C., 2078s
Hillmann, H. D., 1647m
Hills, C. H., 2541
Hills, O. A., 3836
Hilton, R. J., 1203
Hindle, R., Jr., 197
Hinman, F. G., 2706
Hinrichs, H. A., 1160
Hinsvark, O. N., 2939
Hinz, W. W., 1130
Hirota, N., 2884
Hirschmann, H., 648
Hirst, J. M., 2192
Hirt, W., 1314
Hitchcock, A. E., 2621k, 3710
Hitier, H., 402
Hitz, C. W., 2280, 2592, 2595, 2596
Hoare, E. R., 1052, 3425, 3443m
Hobbis, E. W., 111, 165, 201h
Hochhausen, I., 2889, 4021
Hodgson, J. M., 2573, 3759j
Hodgson, R. W., 3100j
Hodnett, G. E., 974
Hofer, A. W., 3841, 3955t
Hoffman, A., 1297
Hoffman, I. C., 1647n
Hoffman, M. B., 2294
Hoffmann, E., 299
Hoffmann, O. L., 1111
von Hofsten, C. G., 3281
Hogan, T. W., 2497
Hogsett, J. N., 3707
Holdeman, Q. L., 309, 2648
Holley, W. D., 631, 632, 2935
Holliday, P., 878, 3119
Holloman, A. J., 3588
Holloway, J. K., 3726
Holly, K., 2550
Holman, J. C. M., 2182, 2643
Holmes, A. D., 2673
Holmes, F. O., 567
Holmes, R. L., 3099
Holttum, R. E., 2085
Holtzmann, O. V., 1813h
Homburg, K., 1008, 1009, 2071
Homero Bassi, R., 1647o
Homès, M. U., 1947
Homeyer, P. G., 3343
Honda, N., 241, 1287, 2395f
Hong Kong Department of Agriculture, Fisheries and Forestry, 2115, 2119d
Hontoy, J., 4065
van Hoof, H. A., 3812
Hoos, S., 754
Hoover, M. M., 2838a
Hoover, M. W., 2689
Hope, A. B., 1115
Hopfen, H. J., 72
Hopkins, B., 2133
Hopkins, C. Y., 1290, 1295c
Hopkins, D. P., 1052, 1145 l
Hopkins, H. T., 1125
Hopp, H., 3339
Hopp, R., 3793
Horber, E., 2545o
Hord, H. H. V., 3117
Hori, Y., 417
Horn, C. L., 3151
Horn, N. L., 2462
Horn, W., 3011k
Horner, C. E., 1719, 4024
Hornstein, I., 3689q
Horsfall, J. G., 3690o
Horst, —., 3436
Horticultural Education Association, 2105, 2119e
Hoskin, F. C. G., 14
von Hösslin, R., 2770
Hosticka, H. E., 3729
(Hotchkiss, J. C.), 3327
Hough, L. F., 2545f, 2545p
Housley, S., 79d, 3443b
Ho[uter, P. J.], 70, 75, 177, 214, 493, 500, 503
Houtman, G., 259
Howard, G. A., 1731
Howard, H. W., 491
Howarth, G., 2688
Howat, G. R., 4306
Howell, R. W., 2152
Howell, W., 1779, 1782
Howland, A. F., 3956o
Howles, R., 424, 646
Howlett, F. S., 2231
Hoy, J. M., 3736
Hoyt, A. S., 1056
Hozumi, K., 3955u
Hsu, R., 2998, 3005
Hu, C. C., 3022, 4184
Huber, H., 2534
Huberty, M. R., 4191
Hudson, J. P., 206, 1240, 1241
Hudson, N. M., 2708
Hudson, W. J., 1508
Huet, R., 2016
Huffaker, C. B., 2490
Huffman, J. W., 1372
Hughes, C. G., 3285, 4399, 4404
Hughes, J. T., 450, 530
Huglin, P., 2477, 2478
Hugo, J. F. du T., 1647g
Hui, W. H., 4446e
Hullen, E., 2721
Hulme, A. C., 2304, 2308, 2309, 2322h, 3520
Hulsmann, B., 620
Humbert, R. P., 3269c, 3269w
Humphreys, F. R., 2875
Humphries, E. C., 3982
Humphry, E. V., 2078t
Hungerford, T. A. G., 2078u
Hunnam, D., 3620
Hunsinger, E. J., 2207
Hunt, O. J., 608
Hunt, P. R. S., 1061a
Hunter, A. W. S., 2228
Hunter, J. A., 3590, 3594
Hunter, J. G., 3999
Hurpin, B., 319
Hurtado Belgado, M. A. J., 1647o
Husch, B., 3010

Hussain, R., 3203
Hutchins, L. M., 1331
Hutchinson, A., 1180
Hutchinson, M. T., 2510
Hutchinson, P. B., 4401
Hutson, R., 1388, 1600
Hutton, K. E., 2455
Huxley, A. J., 4494a
Huygens, R., 2208r
Huysmans, C. P., 3259
Hyams, E., 1023
Hyde, T. G., 465
Hyder, D. N., 3737

Iba, S., 3639
Ibbett, W. C., 5420
I.C.T.A., 838, 845, 964, 1024
I.F.A.C. [Institut des Fruits et Agrumes Coloniaux], 3102, 3115, 3182
Igaravídez, L., 2076
Ignatius, J. G. W., 1148
Ilić, B., 3955v
Iljin, W. S., 3400
Illinois Agricultural Experiment Station, 2106
Imazu, T., 2413, 3876
Imle, E. P., 953
Imperial Chemical Industries Ltd., 79p
Imperial College of Tropical Agriculture, 838, 845, 964, 1024, 1939, 3109, 3118, 3323h
Indian Agricultural Research Institute, New Delhi, 3300
Indian Coffee Board, 3152, 3156
Indian Tea Association, Tocklai, 2068, 3245, 4446s
Indonesia, C.P.V. Experiment Station, 3318
I.N.E.A.C. (Institut National pour l'Étude Agronomique du Congo belge), 834, 2086, 3328, 4358
Inforzato, R., 4332
Ingebrigtsen, S., 1610
Ingram, J., 1147
Ingram, J. W., 4416
Innes, R. F., 4374, 4397, 4446t
Inoue, T., 1897
Institut des Fruits et Agrumes Coloniaux (I.F.A.C.), 3102, 3115, 3182
Institut National de la Recherche Agronomique, 1061i, 3301
Institut des Recherches sur le Caoutchouc en Indochine, 949, 957
Institute of Brewing, 2895
Institutt for Blomstedyrking og Veksthusforsøk, 1806
Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen, 4472
Intengan, C. L., 3781
International Botanical Congress, Stockholm, 3282
International Congress on Vines and Wine, Seventh, 2346
International Society of Sugar Cane Technologists, 3196
Ireland, Republic of, Department of Agriculture, 3323g
I.R.H.O. (Institut de Recherches pour les Huiles et Oléagineux, Paris), 889, 927, 934, 935, 3176
I.R.S.I.A. (Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture, Belgique), 4473
Irvine, F. R., 693
Isaac, I., 1647p, 1647q, 3944
Isaakidès, C., 832h
Isherwood, F. A., 3443n
Ishigaki, K., 4437
Isleib, D. R., 2593
Islip, H. T., 2879, 2891, 4067, 4248
Israel Ministry of Commerce and Industry, 4181
Issa, E., 1912g, 1925
Istas, J. R., 4065
Istituto per il Commercio con l'Estero, 2219
Istituto di Frutticoltura e di Elettrogenetica, Roma, 3283, 3284
Istituto Regionale della Vite e del Vino, Palermo, 3556
Istituto Scientifico Sperimentale per i Tabacchi, Rome, 3960
Ito, H., 2667, 3798
Ivanov, S. M., 1813i
Ivanoff, C., 4016, 4017
Ivanoff, D., 4016, 4017, 4018, 4019, 4026
Ivanoff, S. S., 3833
Ivanoff, T., 4018
Ivens, G. W., 1482
Iwai, S., 664, 2938
Iwama, S., 432, 475, 664, 2661, 2777, 2781, 2938
Iwata, M., 255, 2640
Iyengar, B. N., 905
Izard, C., 402

Jack, A., 1648b
Jacks, H., 422, 542p, 1300, 2543, 2755, 2825, 3607, 3881, 3884, 3933
Jackson, H., 3820
Jackson, P., 371
Jackson, W. T., 3979
Jacob, A., 2180
Jacob, F. C., 1883
Jacob, K. C., 1025
Jacob, W. C., 2553, 3340
Jacobs, K. F., 996
Jacobs, W. P., 33
Jacobson, H. G. M., 2646
Jacombs, F. E., 1742c
Jacyna, A. S., 3484
Jagendorf, A. T., 3443o
Jaggi, E., 3443p
Jakuškina, N. I., 1627
Jamaica Department of Agriculture, 836
Jamalainen, E. A., 1221
James, D. P., 1236g
James, W. O., 3443q, 3443r
Jameson, J. D., 4277, 4338
Jamison, F. S., 1506, 2809
Jan, M. O., 3203, 3204
Janaki Ammal, E. K., 4162h
Jancke, O., 342, 2512, 2518, 2545q
Janes, B. E., 1505, 1506, 3773
Janke, A., 1418, 3937
Jankiewicz, L., 1799
Jannone, G., 2414
Jaramillo Arango, R., 2078v, 3133, 4298
Jarrett, R. M., 156
Jary, C. L., 4041, 4047
Jasmin, J.-J., 3755, 3759f, 3763
Jayadas, C. S., 900
Jayaraman, V., 4430
Jeansonne, R. J., 2044
Jeener, R., 3981
Jeffers, R. H., 1236h
Jefferson, R. N., 626, 672
Jeffery, M. W., 1340
Jeffreys, J. A. D., 1711
Jenkins, A. E., 1863
Jenkins, C. F. H., 1875
Jenkins, J. M., Jr., 1771
Jenkins, P. T., 3618
Jenkins, W. R., 701, 4134
Jennings, E. G., 2191
Jennings, J. P., 372p
Jenny, J., 263
Jensen, D. D., 1330, 3689r
Jensen, F., 2503
Jensen, H. J., 683
Jeppson, L. R., 1878, 3060, 4233
Jermy, T., 483
Jex, W. F. C., 2039
Joachim, A. W. R., 833, 2885
Johansson, E., 118, 149, 1405, 2227, 2331, 3470, 3471
Johar, D. S., 2001, 4442, 4446x
John, C. A., 3826
John, M. E., 438

John Innes Horticultural Institution, 1041, 3302
Johnson, B. L., 2950
Johnson, E., 1444
Johnson, E. M., 3989
Johnson, L. F., 3236
Johnson, R. I., 3792
Johnson, R. M., 4350
Johnson, S. P., 1628
Johnston, A., 1011
Johnston, F. B., 3523, 3524
Johnston, J. C., 755, 756
Joley, L. E., 243
Jolly, A. L., 860
Jones, C. B., 3443s
(Jones, D. K.), 2098
Jones, E. M., 1061a
Jones, E. R. H., 1108
Jones, G. B., 3389
Jones, G. D., 1647z
Jones, G. D. G., 3678
Jones, H. A., 3955w
Jones, J. F., 2465
Jones, K. W., 3759o
Jones, L. S., 1329, 3598
Jones, M. A., 3164
Jones, P. A., 1979, 3157
Jones, W. W., 832i, 1912h, 3035, 3042
de J[ong, L.], 500
de Jong, P., 1016v, 3260, 3269x
Jorgensen, E. C., 2950
Joseph, T. C., 4081
Josepovits, G., 2514
Joshi, G. V., 4060
Joshi, N. C., 924
Joshi, N. V., 3265
Joshi, S. G., 3265
Josifović, M., 2467
Joslyn, M. A., 2303
Joubert, F. J., 1698
Joubert, T. G. la G., 3861
Jouve, R., 3499
Jovanović, B., 2569
Joyner, J. F., 395, 603, 1726
Junges, W., 2418, 2782, 3795
Jungwirth, E., 1825
Junnila, W. A., 2865
Jurin, V. P., 495

Kabi, T., 4071
Kačan, S. S., 3837
Kadam, B. S., 577e, 3971
Kaden, O. F., 1016w, 2078w
Kahl, E., 295
Kahn, R. P., 429, 3863
Kailasarao, T., 890
Kaimal, K. N., 1016x
Kaindl, K., 3412
Kaleganov, A. A., 2421
Kaljtja, A. Ja., 1595
Kallauch, W., 4162i
Kaloostian, G. H., 3689s
Kaltofen, H., 2130
Kammeyer, H. F., 2418
Kämpfe, L., 2545r
Kampmeier, C., 2526
Kanabe, T., 1480
Kanazawa, J., 4438
Kandler, O., 542q
Kaniuga, Z., 1587
Kantor Pusat Statistik, 1016y
Kapadia, V. H., 4003b
Kapoor, L. D., 583, 588, 4015
Kapur, N. S., 925, 2002
Kapuskasing Dominion Experimental Station, Ontario, 1042
Karanjan, B. G., 94
Karmakar, G., 1089
Karnatz, H., 1202, 1308, 2240, 2253
Karner, L., 2626
Karner, P., 1742k
Karpenko, E. R., 1626
Kassanis, B., 2853, 2855, 2970, 3982, 4083, 4084
Kato, T., 2667
Katulska, C., 1169, 1187
van Katwijk, W., 270, 1326, 1327, 1807
Kaudy, J. C., 4203
Kaura, N. R., 3100e
Kawai, S., 4437
Kazjmin, G. T., 2237, 3481
Keane, F. W. L., 1164, 2246, 2247
Kearns, H. G. H., 292, 362, 372q, 2621d
Kebby, R. G., 2008
Kebrle, J., 1742k
Keegel, E. L., 4429
Keen, Sir B., 1917
Keener, P. D., 2642
Keep, E., 3478
Kefford, J. F., 3075
Keijer, E. J., 2451
Keirstead, L. G., 3669
Keitt, G. W., 2545u, 3689c, 3690j, 3599
Kelbert, D. G. A., 3955x
Keller, H., 2544
Keller, J. R., 3008, 4090, 4156
Keller, K. R., 1729
Kelley, V. W., 150, 176
Kelley, W. R., 384
Kelman, A., 1512
Kelsall, A., 1210
Kelsheimer, E. G., 1647r, 1783, 4124, 4162j
Kemmer, E., 3, 201i
Kemmerer, H. R., 3011l
Kemmers, W. H., 8
Kemp, H. K., 2279
Kemp, I., 57, 419
Kempf, N. W., 1965
Kendrick, J. B., Jr., 45, 519, 1082, 1083, 1085, 2666, 2784
Kendrick, J. B. S., 520
KenKnight, G., 2465
Kennelly, A. G., 79q
Kenneth, G., 769
Kenneth, R., 2712
Kennett, B. H., 3689t
Kennett, C. E., 2490
Kent, M. J., 79r
Kent, R. L., 2555
Kent, W. G., 3539i
Kentville Dominion Experimental Station, Nova Scotia, 1043
Kenya Coffee Board, 4446u
Kenya Department of Agriculture, 2119f, 3303
Kerr, E. A., 3918
Kerssen, M. C., 3818
Kessler, H., 1219
Kester, D. E., 3461
Kesteren, Rijkstuinbouwconsulentschap, 3304
Kesterson, J. W., 1889
van Keulen, W., 1135
Keuls, M., 4020
Keyer, E. J., 1341, 2545s
Keyes, C. G., 624
Khan, A. H., 2880
Khan, K. F., 592
Khan, M., 4264a
Khan, M.-u.-D., 783
Khanduja, S.-D., 3269y
Khanna, K. L., 4426
Kick, H., 2135, 3386
Kidd, C., 1742i
Kidder, E. H., 1128
Kidson, E. B., 2817
Kielhauser, G., 155
Kieser, M. E., 213, 1236i
Killian, C., 1016z
Kimball, K., 2372
Kincaid, R. R., 1661, 1689
Kind, W., 3443t
King, K. M., 3900
King, N. C., 2055
King, N. J., 983, 3234, 3285
King, T. H., 372z
Kirby, A. H. M., 3628, 3689u, 3689v
Kirby, R. S., 542c, 4076
Kirchner, H.-A., 1599
Kirchner, J. G., 615i, 832j, 832k
Kirillov, F. F., 1318, 1319
Kirk, E. B., 4096
Kirkham, D. S., 2449
Kirkpatrick, H., Jr., 2621k
Kirkpatrick, T. W., 874, 1964
Kirschner, R., 3713
Kisljakov, V. D., 1814
Kitajima, H., 297

Kitanov, B., 585
Kitzke, E. D., 4068x
Klang, C. A., 1405
Klas, Z., 2171
Klatt, W. L., 1443
Kleczkowski, A., 572, 1697j
de Kleermaeker, E., 2733
Klein, K. F., 447
Klein, S., 2364
Klenk, —., 3689w
Klimenko, K. T., 759, 1829, 1843
Klimenko, V. N., 759, 1829, 3100k
Klindić, O., 575
Klingman, G. C., 1484
Klinkenberg, C. H., 1369
Klinkowski, M., 542r, 2087, 2696
Kljajić, R., 4008
Kloft, W., 1380
Klos, E. J., 272
Klostermeyer, E. C., 2651
Klotz, L. J., 1864, 1912i, 4247
Klougart, A., 2627, 3011m
van der Knaap, W. P., 1943, 1944, 4294, 4300
Knapp, R., 1145m
Knauth, A., 1034
Knight, A. F., 888
Knight, J. R., 80h
Knight, R., 1932
(Knights, J. K.), 2102
Knoblauch, F., 542s
Knoch, K., 230
de Knop, O., 1995
Knoppien, P., 2783
Knorr, L. C., 1854, 1856, 1863, 3061, 3100l
Knott, J. E., 2625
Kobel, F., 3286, 3552
Koblic, J., 1551, 2322i
Koch, E. C., 3632
Koch, E. J., 3342
de Kock, P. C., 3404
Kodenko, A. N., 1281
Kodera, M., 1556
Koelle, G., 3965
Koert, J. L., 3880, 3882
Kofranek, A. M., 638, 641, 3006
Kogan, L., 1017a
Köhler, E., 2087
Kohler, K. O., 2639
Kohli, J. D., 4068t
Kohoutová, Z., 4068m
Kolesnik, L. V., 2376
Kolesnik, Z. V., 1275
Kolosov, I. I., 2178
Koltermann, A., 1679
Komarov, I. F., 124
Kondô, H., 1530
König, F., 3572h
Konstantinov, N. N., 1705
van Koot, I., 64
Koroljkov, E. D., 1497
Koronéos, J. A., 4259
Korte, W., 1647s
Kos, M., 2208d
Koščeev, A. K., 2668
Košelenko, V. M., 108, 2241
Kosilkin, I. A., 1850
Kosugi, K., 663, 713, 2961
Kothiyal, M. D., 4447h
Kott, V., 1214
Kouyeas, V., 1367
Kovachich, W. G., 938
Kozlova, V. I., 4222
Kozlovskiĭ, V. S., 3516
Kozlowski, T. T., 3860
Kramer, A., 468, 542t, 1582, 2134
Kramer, P. J., 3979
Kraus, E. J., 1756
Kraus, H., 1418
Krause, W. G. C., 492, 1647t, 2395g
Kravcova, B. E., 1627
Kreibohm de la Vega, G. A., 4396
Kreĭcberg, V. E., 1145n
Kretschmer, A. E., 2146
Kreutz, W., 2088
Krickl, M., 2764
Kriegler, P. J., 326
Kriel, H. T., 4246
Krimgold, D. B., 2198
Krishna Marar, M. M., 892
Krishnamurthi, S., 2834, 2838m
Krishna Murthy, D. V., 1742l
Krishnaswamy, A. R., 592
Kristensen, H. R., 1647u
Kristensen, R., 4457
Kristoffersen, T., 4136
Krivolapov, G., 1498
Krochmal, A., 2868
Krokan, O., 2395h
Kroll, R., 407
Kroll, U., 1917
Krone, P. R., 2949
Kronenberg, H. G., 211, 2395i
Krotkov, G., 1145d, 3976, 4003e
Krug, C. A., 2078x
Krüssmann, G., 105, 1813j, 1813k, 1813l, 4162k, 4458
Krylov, D. N., 3484
Krylov, M. M., 2315
Krzyzanowska, M., 1632
Kuć, J., 1229, 1230
Kudašev, I. S., 2912
Kuiper, W. H., 79s
Kuitert, L. C., 4152
Kujala, V., 1563
Kukolev, P. A., 1787
Kulkarni, Y. S., 1013
Kummer, A. P., 2089
Kummer, H., 2633
Kundert, J., 1358
Kunokami, T., 1201
Kuperberg, J., 4346
Kuppuswamy, B. S., 3542
Kurmanadha Rao, K. V., 2078y
Kurmies, B., 2208n
Kurokami, T., 803, 1884
Küthe, K., 2539
Kux, M., 2742
Kuznecov, M. D., 3460
Kyriafinis, B., 4259

Labbe, A., 3347
Lachman, W. H., 400, 533
Lacombe Dominion Experimental Station, Alberta, 4474
Ladue, J. P., 4234
La Follette, J. R., 3031
Lafon, J., 1305, 1359
Lagasse, F. S., 1908
Lagesse, R. P., 4446v
Lagos U., J. A., 542u
Lai, T. M., 975
Laibach, F., 2165
Lains e Silva, H., 3508
Laird, E. F., Jr., 3986
Lakon, G., 3011n
Lakshmikantham, M., 4378
Lakshminarayan Rao, M. V., 4446w
Lal, K. N., 79t, 4379
Lalatta, F., 169, 2274, 2288, 3455
Lamb, I. M., 4162l
Lamb, J., 3247, 3249, 3269z
Lamb, R. C., 201j
Lambeth, V. N., 2638, 2778
Lamm, R., 3762
Lana, E. P., 3343
Land, W. B., 415
Landrau, P., Jr., 3231, 4384
Lane, M. C., 3955y
Lanfranchi, J., 1703, 1916
Lange, W. H., 372g, 3790
Langford, M. H., 2027, 4361
Langhans, R. W., 2927, 4082, 4087
Langston, R., 1630
Languad, B., 3955f
(Lantz, H. L.), 1181, 1470
Lanuza, E. A., 4031
Laoh, J. P., 1009, 2164
Lapins, K., 2246, 2247
Lara, B. E., 903
Large, J. R., 2532
Larson, R. H., 1528, 1598
LaRue, C. D., 3356
LaRue, R. G., 761
Lathrop, E. C., 2321
Lathrop, F. H., 2705
Lauden, L. L., 3233

Laue, G., 372r, 2545t
Lauenstein, A., 1518, 2159, 2418
Lauer, E., 1757
Lauffer, M. A., 3323n
Laumont, P., 1567
Lauriol, F., 1886
Lausanne—*see* Mont-Calme
Lavand'homme, C., 3981
de Laveleye, Y., 2606
Lavigne, —., 3447
Lavin, G. I., 1647a
Lavy, J., 2511
Lawalrée, A., 3323j
Lawes Agricultural Trust, Rothamsted, 4494i
Lawrence, E. N., 2194
Lawrence, N. L., 2695
Lawrence, W. J. C., 54, 2166, 2796, 3430
Lawson, G. W., 4066
Laycock, D. H., 4436
Layne, G. W., Jr., 372y
Leach, A., 625
Learner, E. N., 497, 2802
Leben, C., 2545u, 2821
LeBlanc, 3270a
Leblond, C., 3539j
LeClerg, E. L., 2838n
LeCompte, S. B., Jr., 2602, 2603, 2619
Lecomte, R., 2208s
Lecrenier, A., 2269
Lee, F. P., 1026
Lee, I. M., 4264p
Lee, R. E., 3011o, 3011p, 4162m
Leefe, J. S., 3756
Leeper, H. M., 4054
van Leeuwen, E. R., 1383
Leggieri, L., 506
Lehmann, E., 3780
Lehr, J. J., 42
Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau, Geisenheim am Rhein, 3774, 4471
Leiby, R. W., 542d
Leiderman, L., 3946
Lejeune, J. B. H., 598
Lekić, M. B., 338
Lemoine, P., 3981
Lent, J. M., 3804
de Leon, D., 1974
Leonard, C. D., 1840, 3100s, 4201
Leonard, O. A., 1457, 2621e
Leonardi, C., 1871
Leoni, I., 918
Leopold, A. C., 511, 645, 1630, 2157, 3845
Lepage et Cie, 3466
Lepage, H. S., 735g
Le Pelley, R., 1996
LeRoux, E. J., 2670
Leroy, J. F., 1845
Lesley, J. W., 1619
Lesley, M. M., 1619, 2952
Lespes, L., 1870
Lethbridge Experimental Station, Alberta, 4475
Lever, R. J. A. W., 880
Levitt, L. S., 3443u
Levy, A. L., 3443v
Lewis, C. A., 657
Lewis, D., 650, 1620, 3451
Lewis, F. H., 2457, 2545a
Lewis, G. D., 359
Lewis, H., 4162n
Lewis, J. M., 3980
Lewis, Y. S., 4442, 4446x
Lhomme, E. J., 1045
Liard, O., 101, 3457, 3506
Library Branch, Quartermaster Food and Container Institute, Chicago, 201k, 201 l, 542v
Lider, L. A., 1295f
Lieberman, M., 487
Lienk, S. E., 3626
Liger, P., 1618
Light, W. I. St. G., 438
Ligthelm, S. P., 4068n
Liguori, O., 561
Lima, A. R., 4023
(Limasset, P.), 2960
Limberk, J., 1293
Lime, B. J., 3100i
Lin, J. T., 989
Lincoln, J. E., 4446v
Lindgren, D. L., 808, 3661
Lindley, C. D., 4115
Lindsay, W. L., 2147
(Ling, L.), 3573
Link, C. B., 3000
Link, G. K. K., 521
Linser, H., 26, 3383, 3443w, 3713
Linskens, H. F., 1145m
(Linz, E.), 2930
Lipp, L. F., 2925, 4162o
Lisavenko, M. A., 91
Lisicyn, D. I., 3393
List, G. M., 1377
Littauer, F., 832 l, 1888, 3054
Little, D. E., 3433
Little, E. C. S., 3696
Little, H. B., 2924, 3841
Little, L. D., 4078
Little, L. D., Jr., 735m, 2946
Litzenberger, S. C., 2910
Liu, P. D., 971, 976, 4388
Liu, S. Y., 4252
Liverman, J. L., 2160
Livingston, G. A., 1448, 1483
Ljones, B., 1247, 2270, 2271, 2339, 2411, 3485, 3539p
Ljubenkov, A. A., 3450
Ljubimov, A. A., 3432
Llewelyn, F. W. M., 3679, 3680
Lloyd, C., 735k
Lo, T. T., 4409
Lock, G. W., 1917
Locke, L. F., 252
Locsin, C., 997
Locsin, C. L., 1017b, 2046, 2050, 3205, 4371
Locsin, C. S., 2043
Locsin, M. V., 3209
Lodewijks, N. C., 3955z
Loeffler, E. S., 1435g
Loegering, W. Q., 597, 2893
Loest, F. C., 4246
Loeters, J. W. J., 2842
Loewel, E. L., 264, 1315, 2278, 3608
Logcher, C., 2208t
Logothetis, C., 3087
Loh, C. S., 4394
Löhden, A., 1236j
Löhr, E., 4162p
Lona, F., 1112
Long, J. K., 801, 1885
Long Ashton Agricultural and Horticultural Research Station, 1046
Longley, R. P., 115, 122, 142
Loos, C. A., 1010
López Cristóbal, U., 3645
López, H. R., 2893
Lopez, M. E., 3235
López-Matos, L., 1683, 3185, 3984
Lopez-Ramos, B., 2076
Lord, F. T., 349
Lordello, L. G. E., 3100m, 3150
Lott, R. V., 137, 180, 201m
Loue, A., 4331
Lougheed, A. W., 3387
Loustalot, A. J., 1447, 1450, 1459
Louvrier, —., 3077
Lovatt, B. A., 2
Lovvorn, R. L., 404f
Lowe, A. C., 3741
Lownsbery, B. F., 1697k
Lownsbery, J. W., 1697k
Lozovoĭ, D. I., 3640
Lozzia, G., 3660
Luc, M., 3178
Lucacci, G., 570
Lucas, G. B., 574, 3990
Lucas, J. W., 1852, 4218
Lucas, R. E., 1519
Luchini, R., 1
Luck, J. V., 4025
Luckan, J., 1243
Luczakowa, M., 1591
Luddington Experimental Horticulture Station, 1064, 2107, 4479

Ludwig, R. T., 1777
Lugo López, M. A., 973
Luke, H. H., 4406
Luke, W. J., Jr., 4417, 4446y
Lumry, R., 3361
Luna Moreno, C., 4009
Lundstedt, H., 3582
Lunin, J., 3212, 3215
Lunt, O. R., 630, 638
Luque, J. A., 2377
Lušin, V., 3591
Lusis, E., 2438
Luttrell, E. S., 1363
Lyall, L. H., 1510
Lyamungu Coffee Research and Experimental Station, Tangañyika, 1980, 4324
Lycnos, D., 823
Lydersen, D., 3443g
Lyle, E. W., 700
Lynch, L. J., 1586
Lynch, S. J., 4214
Lyneham, A. J. E., 3973
Lyon, A. G., 491
Lytkin, I. A., 2887

M., A., 2208u
M., S., 2838o
Ma, R. M., 1890
Maarse, J., 1403
Maas Geesteranus, H. P., 1697d
Maatsch, R., 659, 2959
Macaulay Institute for Soil Research, Aberdeen, 3305
McAuliffe, C., 3974
McCall, G. L., 1475
McCallan, S. E. A., 1435s
McCants, C. B., 1676
McCasland, G. E., 3331
McCaughey, W. F., 615g
McCauley, B. G., 2322j
McClain, R. L., 4265b
McClean, A. P. D., 1858
McClung, A. C., 2408
McClure, T. T., 3615
McCollam, M. E., 4195
McColloch, L. P., 514
MacCollum, G. B., 3831
McCollum, G. D., 2774
McCollum, J. P., 534, 3914
McCormack, T. H., 2869
McCready, C. C., 3929
McCready, R. M., 3076
MacCreary, D., 364, 542e, 3648
McCully, W. G., 1485e, 1485h
MacDaniels, L. H., 3011q, 3487
McDonald's Corner Dominion Horticultural Substation, New Brunswick, 3306
McEacharn, N., 3323k
McElroy, W. D., 3443x
McFadden, L. A., 647, 4091
McFadden, S. E., Jr., 1795
MacFarlane, E. W. E., 1097
Macfie, G. B., Jr., 4446z
McGeorge, W. T., 20, 251
McGlasson, W. B., 2319, 3614
McGlumphy, J. H., 1242
McGonagle, M. P., 1648c
McGowan, L. J., 1813d
McGregor, S. M., 508, 3921
Machado S., A., 4342
McIlroy, R. J., 3254
McIntosh, D. L., 301, 1345
Mack, W. B., 39
Mackay, J. H. E., 1513
McKay, J. W., 239
McKee, H. S., 1212
McKeen, C. D., 2835, 3952
McKeen, W. E., 1352, 3603
McKenzie, D. W., 3472
McKibbin, R. R., 1070
McKenzie, H. L., 4162q, 4264b
Mackinney, G., 783, 3397
McKinney, R. S., 3098, 3099
McKnight, T., 829
MacLachlan, G. A., 1099
(MacLean, A.), 3230
McLean, D. M., 2838p
MacLean, J. A. R., 1967, 3137
McLeish, J., 2632
McLeod, A. G., 401
Macleod, A. M., 610
MacNay, C. G., 1435i
MacNeill, B. H., 1577
McNitt, V. J., 1797
MacPhee, A. W., 349, 2520
McQuade, H. A., 1762, 2947
McRae, D. H., 31
McTaggart, N. G., 2322a
MacWilliam, I. C., 1730
Madagascar, Inspection Générale des Services Agricoles, 4273
Mader, H., 2208v
Madero Bernal, A., 4296
Madras Department of Agriculture, 2108, 4477
Madras, Director of Information and Publicity, 4476
Madsen, H. F., 372g, 1389, 1435j, 3632, 3649
Maggs, D. H., 3475
Magie, R. O., 735 l, 4106, 4108
Mahmoud, S. E. M., 3071
Maier, A., 1295g
Maillard, J., 319
Maines, W. W., 2653
Maingonnat, A., 3561
Maĭsuradze, N. I., 762, 1820, 1912j
Majewska, W., 2810
Majewski, F., 2810
Malan, A. H., 234
Malan, E. F., 1017c, 1819, 1907, 1931, 2078z, 4355
Malan, H., 2384, 3568
Malavolta, E., 2629
Malaya Department of Agriculture, 943, 1915
Malaya Rubber Research Institute—*see* Rubber
Malcolm, D. G., 2200
Malcolm, J. L., 3927, 4274
Maliga, P., 3493
Mallamaire, A., 913
Mallo, R. G., 1521
Maloney, M., 1573
Malucelli, P., 1152
Mameli-Calvino, E., 694, 817, 1745, 2923
Manaresi, A., 133, 258, 1306, 1810, 2322k, 3494
Mandryk, M., 3988
Manefield, T., 4264q
Manger, W. H., 1415
Manjarrés Castañeda, E., 4297
Mann, A. J., 1164, 2246, 2247
Mann, G., 3337
Mann, L. K., 443, 2838q, 3956a
Manotas A., L. E., 877
Mansfeld, K., 1402
Mansfeld, R., 2326
Manske, R. H. F., 2876
Manzoni, L., 244d, 1274, 2476
Mapson, L. W., 3443y
Marais, J. S., 3314
Marais, P. G., 79u
Maramorosch, K., 2932
March, R. B., 3685, 3689x
Marchionatto, J. B., 1365
Marcus, C. P., Jr., 276
van der Marel, H. W., 1572
Margolis, D., 2276
Mariman, G., 3557
Marinet, J., 615h, 1702
Mariño, E. F., 228
Marinucci, M., 1236k
Mariotti, A., 1718
Márkus, L., 1571
van Marle, G. S., 341
Marloth, R. H., 3018
Marnette, J., 484
Maron, S. H., 1017d
Marsano, M., 2395j
Marsh, R. W., 292, 372s
Marshall, B. H., Jr., 670
Marshall, L. M., 4162r
Marsteller, R. L., 2015
Marth, P. C., 2341, 2691
Martin, D., 1218, 2312
Martin, D. F., 1395
Martin, E. D., 3011r
Martin, H., 1426, 3668, 4264r
Martin, J. A., 1650
Martin, J. P., 768, 795, 1866, 3015, 3029

Martin, J. T., 368, 371, 3293, 3689y
Martin, L. F., 4425
Martin, R. P., 1144
Martin, W. P., 411
Martínez, A., 1978, 3332, 4285
Martino, C., 561, 4002
Martins, J. E. D., 3159
Martorell, L. F., 3239, 3240, 4415
Martyn, E. B., 896
Martyn, E. J., 2708
Marx, K.-H., 3923
Marx, T., 2811, 3821
Mascaranhas, J. P., 2053
Maschek, F., 26
Maskell, E. J., 868
Mason, C. M., 1772
Massee, A. M., 1421, 3287
Massey, C. W., 1789
Massey, D. M., 542w, 2980
Mastalerz, J. W., 702
Mastenbroek, C., 3857
Masters, L. C., 1864
Masuda, T., 1556
Matherne, R. J., 4389
Mathes, R., 4410, 4416
Mathew, E. C., 1740, 4068o
Mathew, K. T., 4339
Mathias, M. E., 4137
Mathis, W. T., 3669
Mathur, P. B., 925, 2002, 4283, 4347, 4443
Mathys, G., 346
Matinjan, A. B., 2125
Matkin, O. A., 2953
Matsumoto, H., 844
da Matta, G. J., 4179
Matthews, L. J., 3699
Matthews, R. E. F., 564
Matthews, W. S. A., 2891, 4248
Mattison, J. R., 1650
Mauch, A., 3687
Maunder, A. H., 2126
Maurel, M. A., 2872
Maurer, E., 3479
Maurer, K. J., 107
Maurié, A., 2375
Mauritius Department of Agriculture, 3307
Mauritius Sugarcane Research Station, 3199, 3270b
Mauritius Sugar Industry Research Institute, 4362
Maury, P., 2395e
Maveroff, A., 244e
Mavrich, E. G., 1269
Maxwell, N. P., 2350
May, W. B., 2208w
Mayer, A. M., 37, 1615
Maymone, B., 832m, 1912k
Maynard, W. E., 1017a
Maždrakov, P. D., 612
Mazzei, A., 2395k
Mazzei Patrone, I., 2545v
Mazzolani, G., 819
Meadly, G. R. W., 3730
Meahl, R. P., 735m, 2946, 4078, 4079
Meeks, J. W., 615d, 1742m
van der Meer, F. A., 275, 2433
van der Meer, H. J., 3255
Mega, K., 2931
Mehrotra, B. S., 1558, 3956b
Meiffren, M., 4343
Melin, E., 3443z
Melis, F., 409
Mellor, F. C., 1345
Melville, A. R., 3163
Mendel, K., 778
Mendes, J. E. T., 908, 910
Méndez, F., 3206
Mendiola-Ela, V., 669
Menezes Mariconi, F. A., 2020, 3639
Mengoli, E., 1810
Menon, K. P. V., 891, 1017e, 3269m, 4314, 4321, 4447c, 4447d
Menzel, R. G., 3043
Mercuri, S., 2656
Merle, P., 3180
Merny, G., 1928
Merrill, L. G., Jr., 1520, 1600
Merrill, S., Jr., 3097
(Mertin, J. V.), 1414
Merwarth, F. L., 2769
van der Merwe, A. J., 770
Mes, M. G., 2181
Mesa Bernal, D., 3145
Messiaen, C. M., 306
Messing, A. M., 1097
Messing, J. H. L., 735n, 2940
Metcalf, J. E., 1076
Metcalf, R. L., 2523, 3685, 3689x
Metcalfe, C. R., 44
Metlickiĭ, L. V., 3070
Metlickiĭ, Z. A., 2257, 3484
Meudt, W., 3381, 3382
van der Meulen, A., 201n, 4349
Meurman, O., 157, 166
Meyers, T., 2395 l
Meyl, A. H., 832n
Mezzetti, A., 2760, 2838r
Michelbacher, A. E., 456, 2493, 2494, 3637, 3638
Michigan Agricultural Experiment Station, 1061j, 4494f
Middlekauff, W. W., 456
Middleton, J. T., 45, 1082, 1083, 1085, 2784
Miettinen, J. K., 80d
Mijušković, M., 1912 l
Mikeš, J., 1236 l
Milbrath, D. G., 4113
Milbrath, J. A., 4150
Miles, H., 2645
Miles, M., 1542, 2645
Miles, P., 466
Miles, P. W., 1684
Mileško, A. J., 93
Miličič, D., 23221
Miljanovskiĭ, E. S., 3100n
Miller, C., 2845
Miller, C. O., 2140
Miller, E. V., 946, 2015
Miller, J. G., 3777
Miller, J. M., 615i, 832j
Miller, L. P., 1435s, 3710
Miller, L. W., 2485
Miller, M. A., 354
Miller M., R., 3125, 3130, 4308
Miller, M. W., 2621f
Miller, P. R., 1865, 3011s
Miller, P. W., 276, 372t
Miller, V. L., 46
Millerd, A., 832o
Millikan, D. F., 271
Milliron, H. E., 542e
Mimault, J., 201t
Minamikawa, J., 4435
Minerbi, G., 268
Minges, P. A., 2838q
Minić, M., 2546 l
Minister of Agriculture, Canada, 161, 246, 247, 547, 654, 1037
Ministry of Agriculture, British Columbia, 2123
Ministry of Agriculture, Hashemite Kingdom of Jordan, 4478
Ministry of Agriculture, London, 6, 352, 372u, 404d, 542x, 542y, 542z, 543a, 615j, 1061k, 1078, 1295h, 1296, 1370, 1435k, 1435 l, 1435m, 1485i, 1647v, 1813m, 2208x, 2540, 2545w, 2634, 2934, 3011t, 3324, 3325, 3420, 3421, 3444a, 3572i, 3689z, 3690a, 3690b, 3690c, 3690d, 3956c, 3956d, 3956e, 3956f
Minz, G., 793, 832p, 2647
Miranda, S., 1957
Mirassou, E., 2598
Mirić, M., 372v
(Mirrado, J. H. M.), 3299
Misailovski, B., 1260
Misro, B., 653
Missingham, L. J., 3183
Mississippi Agricultural Experiment Station, 3308
Missouri Agricultural Experiment Station, 3309
Mitchell, A. E., 179, 2310, 2450
Mitchell, J. W., 30, 1109, 1110, 2208z, 2691, 2697

Mitchell, L. C., 2529
Mitchell, P., 942
Mitchell, R. S., 1586
Mitchell, T. A., 3444b
Mitchell, W., 2922h
Mitchell, W. G., 2926
Mitra, M. N., 4447a
Mitrofanov, P. I., 3995
Mizuno, T., 1530
Mo, T. T., 540, 898
Modlibowska, I., 3545, 3546
Modugno Pettinari, C., 1904
Moffett, J. O., 3424
Mohammad, W., 3216
Mohammad Ibrahim, P. A., 3143
Mohan Rao, M., 3947
Moir, K. W., 13
Mollan, T. R. M., 4023
Molotkovskiĭ, G. H., 707
Molotkovskiĭ, Ju. G., 707
de Mol van Oud Loosdrecht, W. E., 2967, 2969
Monachino, J., 587
Monin, A., 3579
Monk, R. J., 2897
Monnet, J., 848
Monselise, S. P., 1753, 1822, 1841, 3033
Montanari, V., 1323
Mont-Calme, Lausanne, Station Fédérale d'Essais et de Controle de Semences, 1044
Monteith, J. L., 2191
Montelaro, J., 2809, 3955k, 3956p
Montero M., J. M., 3270c
Monzini, A., 2317, 3539k
Moon, H. H., 3721
Moore, D. H., 1452
Moore, J. D., 3599
Moore, J. F., 3856, 3858
Moore, M. H., 3690e
Moore, P. G., 3351
Moore, P. W., 740
Moore, R. C., 2594
Moran, W. T., 3729
Moreau, C., 308, 3073
Moreau, M., 634, 735o
Moreton, B. D., 438, 2743
Moretti, A., 1166, 1173
Morettini, A., 87, 100, 818, 2275, 3081, 3587, 4459
Morgan, N. G., 292, 362, 369, 372q, 2621d
Morgan, R. R. T., 2209c
Mori, H., 1153, 2265
Morris, G. P., 1564
Morris, L. G., 2799
Morris, M. P., 473, 4052
Morrison, A. E., 3663
Morrison, G., 1625
Morrison, K. J., 686
Mort, C. H., 1901
Mortensen, E., 3026
Morton, D., 2891
Moryganov, A. N., 66
Mosebach, E., 315
(Moser, L.), 225
Moser, W., 3427
Moškov, B. S., 2163
Moss, A. E., 1936
Moss, N., 1527, 1533, 1537, 1612
Mosse, B., 1177, 3355
Mostafa, M. A., 3942
Motai, M., 2661, 2777
Mott, R. C., 619, 1748, 4125, 4126
Mowry, D. T., 2183
Much, K., 2505
Mueller, R. T., 742, 2175
Muenscher, W. C., 3759k
Mühendisi, Y. Z., 1663
Mühle, E., 1715
Mühlendyck, E., 1769, 4094
Mühlmann, H., 314
van den Muijzenberg, E. W. B., 79v, 2723
Muir, W. H., 3374
Mujica R., F., 471, 1342
Mukerji, B., 4068t
Mukerji, S., 4419
Mukherjee, S. K., 2079a
Mulcay, W. D., 1283
Mulder, D., 1303, 2401
Mulder, M., 3002
Mullard, S. R., 4070
Müller, F. P., 2761
Müller, G., 2500
Müller, H., 2248, 2418
Müller, R., 288
Müller, W., 3646
Mullin, R. S., 2207
Mullison, W. R., 378
Müllner, L., 232, 1280, 2381, 2395m
Muma, M. H., 1912m, 4241, 4264s
Münchberg, P., 1408
Munger, F., 4235, 4236
Munger, H. M., 441, 442
Mungomery, R. W., 984, 1017f, 2056, 3285, 4420
Munnecke, D. E., 543b, 1761, 2944
Munsche, D., 3444c
Muntañola, M., 3953
Murakishi, H. H., 690, 3011u
Murawski, H., 2322m
Murneek, A. E., 175, 2444
Murphy, M. M., 1363
Murphy, W. S., 768
Murray, D. B., 863, 866, 868, 1946, 1949, 1951, 1952, 1954
Murray, W., 4447b
Murucci, P. E., 2509
Muschett, W. R., 4380
Mushroom Research Association Ltd., Yaxley, 3872
Musser, H. B., 2971, 4120
Mustard, M. J., 4252
Muthuswamy, S., 2922i, 3113
Muzik, T. J., 386, 1447, 1450, 1459, 3186, 3356
Myatt, O. W. D., 2079b
Myburgh, A. C., 1384
Myers, A., 2335
Myers, A. T., 3095
Myers, E. A., 61
Myodo, H., 652
Myrice, F., 3826

N., E., 9
Naaldwijk Research Station for Fruit and Vegetable Culture under Glass, 3827, 3911, 3912, 4100, 4104, 4480
N.A.A.S., 1062, 1063, 1064, 1065, 2107, 4479
Nacentov, D. I., 2672
Nadel-Schiffmann, M., 832l, 1887
Naef, J., 3652
Naef-Roth, S., 3410
Naegele, J. A., 1813n
Nagel, J. F., 3434
Naghski, J., 577f
Nagy, B., 372w, 2514
Nakasone, H. Y., 667
Napier, C. L., 406
Narain, A., 613
Narasimha Rao, G., 3743
Narasimha Rao, P. L., 1742l
Narasimhan, N. S., 4446p
Narasimhan, R., 4391
Narasinga Rao, M., 2078y
Narasinga Rao, U., 1798
Narayana, G. V., 1971
Narayana Rao, D., 3388
Narayanaiyer, S., 4336
Narayanan, E. S., 2059, 2545x, 2838s, 4318
Narodny, L. H., 1742n
Nasca, A. J., 1869, 1882
Nason, A., 3443x
National Institute of Agricultural Botany, Cambridge, 3760, 4481
National Institute of Agricultursl Engineering, Silsoe, 3688
National Shade Tree Conference, 4494g
Natividade, J. V., 99
Nau, H. H., 1445
Naude, T. J., 3315

Naundorf, G., 3126, 3129, 3130, 3134, 3135, 3747, 4293
Nauriyal, J. P., 3030
Nautiyal, K. N., 2881
Navarrette S., C., 4330
Navašin, M. S., 1742o
Navellier, E., 3336
Nayar, T. G., 4278
Naylor, A. W., 1677
Nayudamma, Y., 1739
Neal, O. M., 2999
Neary, M. E., 542k
Neas, I., 1668, 3999
Neff, M. S., 830, 3096
Nègre, E., 832q, 3572j
Negrulj, A. M., 224, 1277
Nehring, G., 79n
Neilson, C. L., 3900
Neiswander, R. B., 4162s
Nekrasova, T. V., 780
Nel, R. I., 2216
Nelder, J. A., 3776
Nelson, F. C., 3675
Nelson, K. S., 643
Nelson, P. E., 1749
Nelson, R., 4251
Nelson, R. O., 4252
Nelson, S. H., 3529
Neri, M., 170
Nesdal, O., 2289, 3485
Nesterenko, G. A., 4224
Nesterov, Ja. S., 1253
Nethsinghe, D. A., 1972
Nettles, V. F., 509, 1506
Nettles, W. C., 3980
Neubauer, H. F., 2416
Neubert, A. M., 1234
Neumann, D., 2916
Neumann, G., 416, 1614, 2776
Neumann, P., 3419, 3786
Neumann, U., 1237
Neve, R. A., 4040
New York State Agricultural Experiment Station, Geneva, 4484
New Zealand, Director-General of Agriculture, 1047
New Zealand, Dominion Council of Commercial Gardeners Ltd., 2119c
New Zealand, D.S.I.R., 604, 2099
Newburgh, R. W., 2154
Newcomer, E. H., 3372
Newcomer, E. J., 330, 2486
Newell, J., 3935
Newhall, A. G., 479, 1515
Newhall, W. F., 804, 4242
Newhook, F. J., 2996
Newman, A. S., 34
Newson, D. W., 3771
Newton, G. K., 3253
Newton, J. H., 1377
Newton, W., 1569, 1681, 3270d
Nichol, W. E., 3528
Nicholas, D. J. D., 2177, 2812, 2813, 3390
Nicholls, G. A., 1742c
Nichols, C. W., 2856
Nichols, L. P., 3690f, 4076, 4162t
Nicholson, J. O., 2236
Nickell, L. G., 1114, 3784
Nickisch, K., 3828
Nicol, J., 1956, 3132
Nicolaisen, N., 1228, 2679, 3338, 3887
Nicolaisen-Scupin, L., 1228, 2765, 3887
Nicolaisen, W., 3917
Nicolini, J. C., 1903
Nicoll, C. P., 3462
Nicoloff, N., 4019
van Niekerk, P. E. le R., 2399
Nielsen, H., 2671
Nielsen, J. P., 3588
Nielsen, W. R., 1485j
Nielson, M. W., 3598
Nietzke, G., 1464, 2838t
Nigeria Agricultural Department, 4269
Nijveldt, W., 540, 4077
Nilsson, A., 4162u
Nirula, K. K., 1017g, 4321, 4447c
Nisen, A., 728, 1525
Nishida, T., 3838
Nisikado, Y., 2480, 2977
Nitsch, J. P., 3367, 3539l
Nizi, G., 1685, 4110
Noël James, C., 1978, 3332, 4285
Noguchi, Y., 3975
Noll, C. J., 1490, 2604, 2607, 2608, 2615, 3761
Noll, C. R., Jr., 3395
Nolte, H. W., 3690g
Noonan, J. C., 4440
Noordam, D., 1697d
Noothout, A. J., 3270s
Nordström, C. G., 661
Norman, P. A., 3062, 3063, 4223, 4237, 4238
Noro, K., 1892, 1897, 1899
Norris, M. V., 3690h
Norris, R. E., 4264t
North, C. P., 744, 3034, 4168
Northcraft, R. D., 1143
Northern Rhodesia, 2840
Northern Rhodesia Department of Agriculture, 4494h
Norton, D. C., 615k
Norton, J. P., 2208y
Novel, P., 88, 2641, 3448
Novickaja, E. I., 1626
Novikof, V. A., 3832
Novikov, N. M., 2669
Novikov, V., 1131
Novoselova, G. A., 1627
N.S.W. Department of Agriculture, 327, 340, 699, 735p, 735q, 735r, 776, 4482
N.S.W. Department of Agriculture, Division of Horticulture, 4212
N.S.W. Department of Agriculture, Division of Plant Industry, 1494
N.S.W. Department of Agriculture, Entomological Branch, 1387, 1411, 1644, 1647w
Nugent, L., 3233
Nutman, F. J., 884, 885, 1970, 3139
Nyasaland Protectorate Department of Agriculture, 2848, 3094, 3251, 3310, 3323l
Nyhlén, Å., 414, 2327, 3585
Nyholm, I., 717
Nyland, G., 3690q

Oberle, G. D., 132, 2236
Oberthur, K., 2857
Oborn, E. T., 3729
Ocfemia, G. O., 4068p
Ochse, J. J., 4264u
O'Connor, B. A., 3149
Odell, G. V., 3898
Odland, M. L., 1490, 2604, 2607, 2608, 2615, 3761
Odom, R. E., 627
O'Donnell, A. E., 3690i
Oganesjan, A. P., 2412
Ogawa, J. M., 1347
Ogawara, K., 444
Ogle, W. L., 2134
Ognianoff, I., 4016, 4017, 4019
Oines, A., 1382
Okada, M., 639, 642, 656
Okazaki, M., 241, 2395f
Okitsu Horticultural Experiment Station, 5
Oku, L., 628
Okumura, M., 652
Olalia, I., 2079l
Oland, K., 2406, 3507
Oldén, E. J., 261, 2322n, 2422
Oldham, F. S., 2382
Olisevič, G. P., 649
Olive, F. R., 2054
de Oliveira, W., 4112
Oliver Espinosa, O., 3748
Oliver, R. W., 1791, 1813o
Ollagnier, M., 3177
Olmo, H. P., 1159
Olmstead, A. J., 3518
Olsen, K. L., 3945

Olson, A. R., 3442
Olson, E. O., 3052, 3058
O'Neill, L. A., 4068q
de Ong, E. R., 2614
Ono, T., 2297
van Onsem, J. G., 618, 4162v
Ontario Department of Agriculture [re. Vineland], 4484
Ontario and Canada Departments of Agriculture, 2545y, 2545z
Oostenbrink, M., 1549
Opitz, K. W., 3032
Opsomer, J. E., 3101
Oratovskiĭ, M. T., 2242, 3484
Orbeck, K., 3963
Orchard, E. R., 1701
Ordish, G., 2090
O'Reilly, H. J., 274
Orellana, R. G., 1958, 3131, 3136, 4305
Organization for European Economic Co-operation, 2531
Orian, G., 4408
Orillo, F. T., 527, 4403
Orillos, M. O., 4188
Orlando, A., 3639
O'Rourke, E. N., Jr., 830
Orsanskaja, V. N., 3056
Orsenigo, J. R., 1478, 2566
Ortega, J. C., 312, 1867, 2515
Orth, H., 3895
Osawa, T., 2413
Osborn, A., 1027
(Osborne, A.), 3539m
Osburn, M. R., 3576, 4237
Osnickaja, E. A., 3891
Östlind, N., 2290
Osvald, H., 3282
Otomo, C., 2252
Otsuka, S., 241
Ovčarov, K. E., 25
van Overbeek, J., 3375
Overcash, J. P., 2395n
Overman, A. J., 4124
Owen, O., 542f, 2644, 2940, 2980
Owens, H. S., 3076
Oyaizu, W., 2297

Pablo Duque, J., 1983
Paclt, J., 2992
Padfield, C. A. S., 194, 3584
Padhi, B., 3905
Padmanabha Raju, B., 1813p
Padmanabhan Nambiar, K. P., 4445
Paech, K., 15
Paeschke, J., 2722
Pagán, C., 473, 4052
Pai, B. R., 4446p
Paisley, K., 735s, 3011v
Pak, K. H., 2595
Pakistan Cooperation and Marketing Department, 4250
Pal, N. L., 3971
Paliatseas, E., 4392, 4393
Palilov, N. A., 1594
Palmer, C. W., 3004
Palmer, J. K., 2867e
Palmer, M. A., 1377
Palmer, R. C., 1222
Palmira, Campaña Nacional de Cacao, 3320
Palmira, Estación Agricola Experimental, Colombia, 3311
Palmiter, D. H., 289
Palti, J., 1553, 2647
Panattoni, A., 543c
Pandalai, K. M., 4447d
Pandittesekera, D. G., 2885
Panjan, M., 3591
Pao, T. P., 972
Papadopétros, G., 4259
Papaïoannou, A. J., 1905
Pape, H., 662, 735t
Papo, S., 3084
Paredes, A., 1079
Parfenov, M., 3919
Parham, B. E. V., 3270e
Paris, D., 4011
Parker, E. R., 787
Parker, K. G., 272
Parker, R. L., 3424
Parkey, W., 4058, 4059
Parks, R. R., 1437
Parmentier, G., 3583
Parnjakov, V. L., 2747
Paronjan, G. H., 1273
Parr, W. J., 543d
Parra H., J., 907, 3161
Parris, G. K., 1647x
Parsons, C. S., 2804
Parsons, W. T., 1468
Parthasarathy, S. V., 4378
Pasquier, H., 2657
du Pasquier, R., 4266
Pass, H. A., 3708
Passecker, F., 155
Passino, F., 1028
Passlow, T., 4264q
Paszewski, A., 2675
Patel, G. I., 2395t
Patel, M. K., 1013
Patel, M. S., 1696, 3961
Paterson, D. R., 2754
Paton, F. J., 2079c
Paton, M. R., 4159
Patt, Y., 764, 1823
Pattabhiraman, T. V., 1987
Patterson, J. B. E., 2546a
Patterson, N. A., 1424
Patton, M. B., 3809
Paturau, J. M., 2061
Paul, W. R. C., 1015
Paunoviċ, S., 273
Paur, S., 2868
Pavićević, B., 3592
Payen, B., 3622
Payette, A., 2468
Pazourková, Z., 3967
Pearce, D. A., 3759l
Pearce, S. C., 3486
Pearse, H. L., 1690
Pearson, C. E., 1029
Pearson, C. H. O., 3270f, 4447e
Pearson, G. A., 3916
Pearson, J. A., 2311
Pease, R. W., 240, 2395o
Pech, H., 1292, 1894
(Pedersen, K.), 3276
Peiris, J. W. L., 1955, 2837, 3270d
Pélécassis, E. D., 4258
Peleg, J., 3084
Pélegrin, P., 1922
Pelletier, E. N., 302, 2459
Pelletier, R. L., 3690j
Pelluchi, L., 543e, 1813q
Pemberton, C. E., 4447f
Pence, R. J., 365, 832f
Pengelly, R., 3753
Penman, F., 2382
Penney, G. L., 397
Penningsfeld, F., 2185
Pennsylvania Agricultural Experiment Station, 3323m
Pennsylvania College of Agriculture, 2546b
Pentzer, W. T., 3368
Pepper, B. B., 2831
Perco, E., 2395p
Pereira, H. C., 1917
Pereira Pinto, G., 1737, 1738
Perelló Barceló, J. M., 4009
Peretz, I., 824
Perez S., V. M., 914
Perez, V. M., 2012
Perkins, D. Y., 2616
Perkins, H. F., 3408
Perkman, O., 1834
Perrier, E., 1337
Perrot, A., 2545e, 3689b
Pershad, G. D., 3719
Persson, A. R., 433, 1623
Pesante, A., 1764
Petelot, A., 1742p
Petersen, A. W., 2671
Petersen, E. L., 1677
Petersen, H. I., 404e
Petersen, V. J., 2671
Peterson, C. E., 2752, 3955w
Petrosini, G., 539, 2844
Petrović, N., 2546l
Petsiavas, D. N., 4249
Pettey, F. W., 1485k
Peyer, E., 1295i, 2395q, 2534, 3566, 3578

Peynado, A., 3038, 3039
Peynaud, E., 2375
Phillips, W. R., 3523, 3524, 3528, 3529, 3539q
Philp, J., 2599
Philpott, J., 1190
Philpott, M. W., 962
Phipers, R. F., 2922c
Phouphas, C., 1113
Picard, J., 2681
Picco, D., 2473
Pichel, R., 952
Pickett, A. D., 1424
Piedrabuena, A. E., 233
Piemeisel, R. L., 1511
Pienaar, W. J., 2399
Pieniążek, S. A., 1188
Pierce, W. C., 1371
Pieri, G., 1378
van der Pijl, L., 23
Pijls, F. W. G., 79w
Pillai, P. N. B., 3961
Pillai, V. G., 1700
Pillsbury, A. F., 59, 1145o, 2197
Pinckard, J. A., 3943
Pinelli, A., 1264
Piñero, M., 3228
Pinskver, E. M., 3464
Piringer, A. A., 3915
Pirovano, A., 2345
Pirzada, A. G., 4348
Pisek, A., 19
Pitcher, R. S., 3644
Plá, J. L., 3167
Plakidas, A. G., 714, 2991, 3011b
Plank, R., 1236m
Plant, W., 3805
Plasman, A., 287, 4092
Plate, H.-P., 1061 l, 2496
Platonova, E. M., 455, 3830
Plaut, M., 321
Plaza Prieto, J., 1893
Plock, H., 125, 1236n, 3480
Ploper, J., 1647y
Plummer, B. E., Jr., 2517
Poapst, P. A., 3500, 3524, 3539r
Poe, C. F., 3808
Poggi, G., 2395r
Pogliaga, H. H., 2867a
Pogorleckiĭ, B. K., 2945
Pogosjan, S. A., 1263
van de Pol, P. H., 1399
Poland, J. L., 3714
Polania Trujillo, H., 3270g
Polhemus, D. N., 2193
Poljakoff-Mayber, A., 2173, 2775
Pollard, A., 213, 370, 1236i
Pollard, A. G., 248, 1052
Polunin, Ja. Ja., 1562
Polunin, N., 3348
Ponce, J. R., 1268
Ponniah, L., 3011w
Pope, D. T., 441, 442
Popov, V. R., 4439
Porozov, A. K., 1768
Porritt, S. W., 1222, 3519, 3525
Portères, R., 1742q
Port Moresby, Department of Agriculture, Stock and Fisheries, 2116
Portolés Alonso, A., 2888
Portsmouth, G. B., 3248, 4432
Poruckiĭ, Ju. V., 1155
Posnette, A. F., 1328, 3589, 3600
Post, J. J., 201o
Postlethwaite, J. D., 2799
Potter, C., 2703, 4050
Potter, G. F., 3341
Potter, J. M. S., 95
Pottier-Alapetite, G., 3347
Potuljnickiĭ, P. M., 1463
Poulos, P. L., 280
Pound, G. S., 565, 1528
Powell, A. A., 79x
Powell, D., 293, 303, 372a
Powers, H. R., Jr., 574
Powers, J. B., 1883
Prakash, A., 4447h
Praloran, J.-C., 2281, 3444d, 4206, 4210, 4211
Pramer, D., 1555
Prasad, V. G., 4419
Pratolongo, U., 2344
Pratt, H. K., 2141, 3893
Pratt, L. C., 199
Pratt, R. M., 4230
Preece, I. A., 610
du Preez, D., 3092
van Prehn, E., 3160
Preston, A. P., 119, 1236o, 3467, 3477, 3503, 3504
Preston, J. F., 2091
Preston, W. H., Jr., 729, 1109, 1110, 2208z, 2691, 2697
Preusker, H., 2838u
Prevot, P., 2005, 3177
Price, C. A., 3394
Pridham, A. M. S., 2584, 2981, 2998, 3005
di Prima, S., 1271, 4255
Primault, B., 2417, 2426
Primrose, C., 1998
Prince George, Dominion Experimental Station, B.C., 1048
Princi, F., 2546c, 3690k
Proctor, C., 2824
Proctor, J. M., 2617
Proebsting, E. L., 147
Proefstation der C.P.V. te Bogor, 1030
"De Proeftuin" te Boskoop, 617, 696
Prohorov, N. K., 1830
Prokofjev, S. D., 2340
Pronk, F., 2004
Prosser, D. S., 800, 1880
Protasov, A. F., 66
Protsenko, A. E., 720
Protsenko, E. P., 720
Pryor, M. R., 2568
Puccini, G., 2936, 4069
Pugh, A. L., 3402
Pulselli, A., 818, 3081
Pupillo, M., 2482, 3085
Purdue University Agricultural Experiment Station, 4485
Purewal, S. S., 2870
Puri, B., 4162x
Purss, G. S., 852
Purvis, C., 936
Purvis, E. R., 1209, 2266
Putov, V. S., 112
Puttarudraiah, M., 3270h
Puzzi, D., 1862, 4422
Puzzilli, M., 1657, 2843, 2846, 3966
Py, C., 941, 3182, 3750

Quackenbush, F. W., 200, 1229
Quadt, F., 543f
Quantz, L., 469, 36901
Quarrell, C. P., 1538
Quastel, J. H., 3415
Queensland Bureau of Sugar Experiment Stations, 2037
Queensland Department of Agriculture, Horticulture Branch, 1930
Queensland Department of Agriculture and Stock, 2109
Quenouille, M. H., 4460
Quick, C. R., 1466, 3732

R., D. L., 3483
van Raalte, D., 210, 2958
Rack, K., 35
Rademacher, B., 1500
Rademacher, R., 3333
Rader, W. E., 488
Radha, K., 1579
Radhakrishna Rao, K., 3113
Raeber, J. G., 3962
de Rafols, W., 2903
Ragazzi, G., 4028
Raggio, M., 1846
de Raggio, N. M., 1846
Raghavan Nair, K. N., 4049
Rahn, E. M., 2595, 2596, 2610, 2692
Rai, G. S., 2206, 2621g
Rajagopalan, S., 2878
Rajagopalan, T. S., 4447g

Rajasekhara Mudaliar, C., 3011x
Raleigh, G. J., 3926
Ramachandran, K., 1017m, 4336
Ramakrishnan, V., 3011x
Ramalingam, V., 4444
Ramanath, S., 3270i
Ramasomayajulu, M. V., 2325
Ramasomayazulu, M. V., 3171
Rambier, A., 3690m
Ramcke, C., 2079d, 3444e
Ramsbottom, J., 1031
Rämsch, H., 2621h, 3512
Ramsey, G. B., 514, 1540, 3896
Ramsfjell, T., 2400, 4103
Ranasinha, G. O. W., 1767
Ranjan, S., 4447h
Ranney, C. A., Jr., 3954
Ranson, S. L., 1145u
Rao, H. K. S., 4315
Rao, J. S., 543g
Rao, K. R. N., 843
Rao, M. B. S., 1017h
Rao, V. S., 1813r
Rao, V. T., 843
Raphael, T. D., 2801
Rappaport, J., 2172
Raptopoulos, T., 129
Rasmussen, C. L., 2630
Rasmussen, C. R., 2717
Rasmussen, L. W., 3720
Rasmussen, W. B., 2651
Rataj, K., 4068r
Ratkovich, M., 1869, 1882, 1912n
Ratner, R., 1906
Raucourt, M., 372x, 2521
Rauterberg, E., 3444f
de Ravel, G., 428
Ravensberg, K., 393, 730
Ravenscroft, A., 1794
Raw, G. R., 3539n
Rawlins, T. E., 3985
Ray, T., 4369
Raymond, C. B., 3794
Raymond, W. D., 2894, 4350, 4447i
Razvjaskina, G. M., 1697l
Rea, H. E., 1472
Read, W. H., 450, 522, 530, 3689u
Reader, D. E., 579
Reark, J. B., 4162y
Rebandel, Z., 1171
Rebour, H., 2092, 2121, 3513, 3572k
Rebstock, T. L., 2149
Reder, R., 3898
Rediske, J. H., 1117, 1119, 3407
Redlich, F., 1848
Reed, G. B., 1145d, 3976, 4003e
Reed, J. P., 2831
Reekers, I., 2136
Reeser, L. G., 2045
Reeve, R. M., 2328, 3543
Reeve, W., 2208z
Refsdal, K., 2411
Regan-Mastnak, A., 3591
Rege, R. D., 2053
Regina Dominion Experimental Substation, Sask., 1061m
Régnier, R., 319
Rehbein, C. A., 2047, 3232
Rehm, S., 2767
Reich, H., 318, 1397, 3677
Reichart, G., 372w, 2508
Reichert, I., 1859
Reid, R. D., 2
Reimer, C. A., 2343
Reinders-Gouwentak, C. A., 499, 1106
Reinhold, J., 1132, 1616, 2786
Reinmuth, H., 2431
Reisaeter, O., 106
Reisch, W., 3964
Reitsema, J., 4010
Reitz, H. J., 3049, 4199
Rejman, A., 1188
Remmert, L. F., 2695
Rempe, H., 2731, 2742
Remy, P., 2256
Renac, J., 201t
Renard, —., 735w
Renaud, M., 201p, 2298, 4190, 4207, 4264v
Renaud, P., 820, 1900
Renaud, R., 1959
van Rensburg, W. J. C., 427
Rentschler, H., 3536
Repp, G., 3759m
Research Council of Israel, 3288
Resende, F., 4129, 4130
Resing, W. L., 2030, 2031, 2079e
Restrepo P., H., 4302
Retief, D. F., 3959
Reuther, W., 769, 4200, 4213
Revhaug, H., 433
Reyes, G. M., 4032
Reynolds, H. T., 1372, 1523, 1878, 3690n
Reynolds, H. W., 3892
Reynolds, T. M., 1215
Reyntens, H., 158
Rhoads, W. A., 779
"The Rhodesian Farmer", 4486
Rhododendron-Gesellschaft, Bremen, 728, 4157
Rial Alberti, F., 1804
Ribaldi, M., 1366, 3666, 4162z
Ribas, I., 615l
Ribéreau-Gayon, P., 1295j
Ricada, D., 3956g
Ricasoli, B., 2353
Ricci, A., 201a, 219
Rice, C. E., 2867b
Rice, E. L., 1107
Rich, C., 4214
Rich, S., 3630, 3690o
Richards, A. V., 858
Richards, M., 3829
Richards, R. R., 2801
Richards, S. J., 4191
Richardson, A. E., 1007
Richardson, B. H., 687
Richardson, F. N., 2896
Richardson, J. M., 383
Richardson, P., 86
Richardson, S. D., 2988
Richter, B., 3515
Richter, H., 2429, 4462
Rick, C. M., 543h
Ricker, D. W., 752, 4264l
Riedl, W. A., 4068s
Riehl, L. A., 3100o, 4232, 4233, 4234
Rieman, W. III, 1087
Riepma, P., 2621i
Riera, A., 4446i
Ries, S. K., 2600, 2609, 2611, 2612, 2618
Rietsema, J., 48
Rieuf, P., 2816
(Rijkstuinbouwconsulentschap Maastricht), 3606
Riker, A. J., 3374
Rimando, V. C., 553
Rings, R. W., 372y
Risdon, E. J., 1017i
Ritcher, P. O., 1647z, 1771
Ritchie, R. M., Jr., 1695
Rittershausen, P. R. C., 3289
Rivals, P., 1017j
Rivera H., R., 1935
Rivoire, P., 2333
Rjadnova, I. M., 1186, 1289
Roach, W. A., 3467
Robb, C. J., 1407
Robbins, W. R., 3408
R[oberts], E. A. H., 3270j
Roberts, E. J., 4425
Roberts, F. M., 884, 885, 3139
Roberts, H. A., 3705, 3752
Roberts, J., 3686
Roberts, R. H., 2299
Robertson, J. H., 1436
Robertson, J. K., 4333
Robertson, J. R., 4401
Robertson, J. S., 986
Robertson, M., 2334, 3548
Robertson, R. N., 18, 2311
Robertson-Cuninghame, R. C., 3379
Robinson, B. D., 1468
Robinson, B. P., 1442, 1471
Robinson, D. W., 3651, 3689a

Robinson, E., 2145
Robinson, J. B. D., 3217, 3749
Robinson, P., 2189
Robinson, W. B., 532, 2371
Robson, J. W., 4115
Roby, F., 2234
de la Rocha G., G., 923
Roche, P., 1017u
Roche, R., 226
Rochecouste, E., 396, 2548, 3759n
Rock, R. C., 1851
Rockland, L. B., 782
Rod, J., 1742e
Rodgers, E. G., 1458
Rodney, D. R., 4221
Rodrigo, P. A., 3883
Rodrígues, G., 872, 1953
Rodrígues Sardiña, J., 568
Rodrĭguez Berretta, H. T., 1413
Rodriguez-Colon, F., 1014
Rodriguez Landaeta, A., 1643
Roesler, R., 2488
Rogalev, I. E., 1504
Rogers, B. L., 145, 2285, 2403, 3495, 3498
Rogers, H. H., 1932
Rogers, W. S., 1254, 1435n, 2423
Rohrbaugh, L. M., 1107
Roistacher, C. N., 666, 4247
Rojas, B., 4447j
Rojecka, N., 3611
Rokach, A., 1842
Roland, G., 2772
Rolin, P., 84
Roll-Hansen, J., 2788, 3349, 3800
Romanovič, E. A., 2794
Rombouts, J. E., 1017k
Romero Manrique, A., 2041
Romney, E. M., 1118, 3399
Romshe, F. A., 3772
Roosje, G. S., 3690p
Rooyen, C., 1701
Rosa, M., 1636, 3948
Rosanow, M., 3702
Rosborough, T., 1545
Rose, E. S., 4433
Rosenquist, E. A., 1942
Rosenthal, C., 2883
Rosewarne Experiment Horticulture Station, 1065
Rosillo, M. A., 1868
Ross, E., 1431, 2524
Rosselet, F., 763
Rossin, M., 1077
Ross Wood, G. A., 4286
Röszler, P., 2929
Roth, I., 4163a
Rothamsted Experimental Station, 4494i
Rothlin, E., 1393
Rouillard, G., 965, 4375
Roulon, 98
Roulon, F., 1162
Rouquerol, P., 4
Rouse, A. H., 4264c, 4264w
Rousset, P., 2511
le Roux, J. C., 3539o
le Roux, M. S., 234, 1285, 1286
Rowley, G. D., 2978
Roy, D., 391
Roy, R. S., 3172
Royal Horticultural Society, 676, 681, 726, 1049, 1061n
Royal Institute for the Tropics, Amsterdam, 1050, 1061o
Rubber Research Institute of Ceylon, 948
Rubber Research Institute of Malaya, 947, 955, 956, 958, 960, 961, 2021, 3187, 3189, 3194, 3751, 4447k
Rubin, B. A., 138
Rudd, N. G., 380
Rudolph, E. D., 2918
Ruehle, G. D., 2075, 4264x
Ruggieri, G., 792
Rui, D., 3086
Rumbeke-Beitem (Westvlaamse Proeftuin), 2110
Rünger, W., 659, 2959
Runov, V. I., 3837
Rupert, C. S., 1813v
Russe, G., 825
Russell, J. C., 1145p
Russell, O. S., 4267
Russell, R. C., 2565
Russell, R. S., 1051
Russell, T. A., 862
Russell, W. A., 1302
Russo, F., 832r, 4180
Ruszkowska, I., 3956h
Ruszkowska, M., 1631
Ruxton, J. P., 3545, 3546
Ryall, A. L., 186
Ryle, M., 3414

Saaltink, G. J., 1604
Saanichton Dominion Experimental Station, B.C., 4491
Sacantanis, K. B., 3088
Sackston, W. E., 2922j
Sagač, J. A., 3484
Sahm, U., 2811, 3821, 3862
Šaĭtan, I. M., 92, 1192
Saito, H., 4068c, 4068d
Sajnani, B. T., 577e
Sakamoto, K., 2265
Sakamoto, Y., 4447l
Sakanishi, Y., 2931
Sakharam Rao, J., 689
Säkö, J., 1170
Salcedo V., D., 4301
Saleh, A. M., 1641
Saleh, M. S. E., 1732
Salgado, M. L. M., 1972
Salisbury, Sir E. J., 688
Salmon, E. S., 4040
Salter, P. J., 507, 2814
Salter, R. M., 1057
Šalyškina, V. I., 4225
Samantarai, B., 4071
Sambamurty, K., 4444
Sambasiva Rao, I. K., 3264
Samisch, R. M., 3365
Samish, Z., 784
Sampson, R. E., 1777
Samuels, G., 1802, 3270k, 4384, 4447m
Samuels, J. K., 2395l
Sánchez-Nieva, F., 2076
Sancier, K. M., 1145s
Sander, A. F., 1784
Sanders, F. R., 1917, 1980, 4324
Sandwith, N. Y., 2078c
Sanford, K. H., 2520
Sankarasubramoney, H., 4447d
Santa Barbara Botanic Garden, California, 2119h
Santere, D., 825
Santini, R., Jr., 922, 1017l
Santo Domingo, J. P., 4447n
Santucci, F., 2862
Saponaro, A., 1361
Sapožkov, I. A., 1176
Sarasola, A. A., 3083
Sarawak Department of Agriculture, 2119i
Sardone, L. T., 3270l
Sarejanni, J. A., 1905
Sarles, R. L., 3441
Sarlo, M. A., 331
Sarma, P. S., 3444i
S[armah], K. C., 3258, 3261, 3262, 3269j
Šarova, N. L., 4105
Sasaki, S., 3855
Sasimir, J., 2208r
Šaškin, I. N., 1251
Sasser, J. N., 574
Sastri, R. L. N., 2079g
Sastry, A. S., 557
Sastry, S. G., 615
Satina, S., 48, 4010
Sato, K., 1208, 2484
Satyabalan, K., 3144
Satyanarayana, M. C., 3155
Satyanarayana, M. N., 543i
Satyanarayana, P., 2527
Sauer, H. F. G., 915, 3946
Sauer, M. R., 1833
Saulsbury, A. O., Jr., 1582
Saunby, T., 2093
Saunders, A. R., 3316
Savage, E. F., 2461
Savinskiĭ, P. I., 3359
Savvides, K., 3048

Savzdarg, V. E., 3635
Sawada, E., 3855
Sax, K., 2244
Sayeed, P. M., 893, 1971
Sayre, C. B., 532
Scaramuzzi, F., 110
Scaramuzzi, G., 1301, 1310, 4149
Scaranari, H. J., 4332
Scarascia, G. T., 4003c
Scarchuk, J., 2838v, 3804
Ščepotjev, F. L., 2393, 2394, 3571
Sch., F., 74
Schachtner, N. D., 3863
Schaffe, P. S., 1890
Schaffer, J. J., 979
Schaffnit, E., 3419, 3786
Schanderl, H., 2409
Scharrer, K., 3413
Scheck, H., 3444g
Scheibe, A., 3852
Scheidecker, D., 1016t, 2005
Scheijgrond, W., 3897
Schellenberg, A., 2425
Schenk, P. J., 4109
Schenker, H. H., 1087
Schetters, C., 1433
Scheuer, P. J., 844
Schindler, A. F., 4135
Schlegal, D. E., 3985
Schlesinger, W., 4054
Schlocker, A., 3690q, 3690v
Schlotzhauer, E. O., 82
Schmid, H., 1742k
Schmid, K., 3963
Schmid, V., 4447o
Schmidt, E., Jr., 3956i
Schmidt, G., 611
Schmidt, G. J., 2783
Schmidt, H., 1349
Schmidt, H. A., 4151
Schmidt, H.-H., 1570
Schmidt, M., 1156
Schmidt, N. O., 3220
Schmidt, O., 3712
Schmit, J., 324
Schnack, B., 4131
Schneble, K., 2185
Schneider, F., 2546d
Schneider, H., 3050, 3051
Schneider, I. R., 4003d
Schneider, R., 3444h
Schoenleber, L. G., 4059, 4061
Schoenmaeckers, J., 615m
Scholfield, B., 3572l
Schomer, H. A., 487, 1227
von Schöning, R., 2546e
Schöntag, A., 3541
Schopp, R., 1581, 2706
Schread, J. C., 2942, 4143, 4145
Schreuder, W. H. E., 4307
Schroeder, C. A., 746, 1891, 4171, 4172, 4174, 4254
Schroo, H., 2052, 2079f, 3218, 3220, 4376
Schumacher, G. J., 3759k
Schumacher, W., 622
Schuphan, W., 1213
Schuppe, E., 1243, 3540
Schuster, G., 3373
Schütz, F., 3552
Schütze, E., 3456
Schvester, D., 322
Schwabe, W. W., 1813s
Schwalen, H. C., 1130
Schwanitz, F., 3357
Schwartz, D., 3968
Schwarzenbach, H., 2356
Schweers, V. H., 2570
Schweiger, H., 2983
Schweizerischer Obstverband, 201q
Schwemmle, B., 1092
Schwerdtfeger, F., 2546f
Sciaroni, R. H., 430, 630, 2581, 2941, 3006, 3790
Scofield, H. T., 1673
Scoresby Horticultural Research Station, Vict., 2215
Scott, D. H., 2341, 2469
Scott, L. E., 542t, 2635
Scott, R. A., 1294, 2390
Scott, W. W., 2919
Scrivani, P., 526, 3055
Scudder, G. K., Jr., 4200
Scurti, J., 2322c
Seale, C. C., 395, 603, 1726
Seale, P. E., 4284
Searcy, V. S., 1467
Šebánek, J., 3922
Sebastine, K. M., 4029
Sedláček, J., 2322o
Seeley, J. G., 2989
Seely, C. I., 3757
Segall, R. H., 478
de Segura, C. B., 788, 1735
Seifert, F., 3437
Seifter, E., 2144
Seilleur, P., 2208s
Seinhorst, J. W., 3885
Sekhar, B. C., 1016m
Selders, A. A., 1119, 3407
Sell, H. M., 512, 2149, 2209b
Selle, R. M., 1826, 4185
Semb, G., 3539p
Semel, M., 3690r
Sen, N. K., 4068f
v. Sengbusch, R., 1243, 3551
Senn, T. L., 1650
Senna Braga, O. T., 4037
Seoane, C., 615l
Sequeira, L., 2151
Serena, G., 2360
Sergeeva, K. A., 1898
Sergeeva, K. D., 204, 1238
Serizawa, M., 432
Serr, E. F., 2391, 3572m
Service Botanique et Agronomique de Tunisie, 4487
Service de l'Horticulture, Rabat, Maroc, 4208
Service de la Protection des Végétaux, Algérie, 4239
Seshadri, C. R., 893
Seshadri, T. R., 615c, 3011w, 4162x
Seshagiri, P. V. V., 2079g
Sethi, W. R., 3141
Seychelles Department of Agriculture, 1061p
Shafer, N. E., 3709
Shah, S. M. I., 2124, 3204
Shankar, J. V., 1088
Shanks, J. B., 729, 3000, 3008
Shanmukha Rao, N., 1017m
Sharif el Din, H., 3759o
Sharma, M. K., 2243
Sharma, M. R. G., 615
Sharma, P. C., 2674
Sharma, S. L., 981
Sharma, V. N., 4068t
Sharp, D. G., 563
Sharp, S. S., 377
Sharpe, R. H., 256, 1291, 2387, 3572n
Sharvelle, E. G., 360
Shaulis, N., 2371, 2372
Shaulis, N. J., 2369
Shaw, E., 3043
Shaw, F. R., 16
Shaw, H. R., 4390
Shaw, M., 1099
Shaw, R. H., 2793
Shaw, W. C., 404f
Shaw, W. L., 2630
Shay, J. R., 285, 359, 2233, 2545f, 2545p
Shear, C. B., 831, 3095
Shear, S. W., 1236p
Sheard, E., 522
Sheat, D. E. G., 3711
Shedley, D. G., 1875, 3643
Sheets, O., 410
Sheikh, M. A., 4386
Shelford, K. O., 2070
Shepherd, J. L., 2867b
Shepherd, K., 1921
Shepherd, R. W., 3803
Sherbakoff, C. D., 791
Sherman, M., 2704
Sherrer, J. D., 4148
Shetty, H. M., 1017n
Shichijo, T., 2484
Shimp, N. F., 4199
Shirley, R. L., 2302
Shisa, M., 3956j
Shivas, J. A., 1127
Shmueli, E., 2805, 3116
Shoji, K., 1923

Shuel, R. W., 1127
Shukla, T. C., 462
Shull, A. V., 3038
Shurtleff, M. C., 735u
Shutak, V. G., 197, 198, 199
Sibilia, C., 1360, 1362
Sick, E., 2477, 2478
Siddappa, G. S., 79y, 3046, 4275
Sidorov, V. S., 4439
Siegelman, H. W., 269, 1790
Siegler, E. H., 3682
Sierra Leone Department of Agriculture, 1061q, 4494j
Siev, D., 504, 668, 2805
Sievers, E., 2838w
Sigel, E. M., 2713
Silberger, J., Jr., 36
Silberschmidt, K., 2987
Silina, Z. M., 4118
Silsoe, National Institute of Agricultural Engineering, 3688
de Silva, C. A., 2022, 2024
Silva, E., 3228
Silvy, A., 3182
Siminovitch, D., 1811
Simkover, H. G., 2546g
Simmonds, F. J., 992, 1927, 3270m
Simmonds, N. W., 847, 1927, 2079h, 3110, 3111, 3269t, 3270n, 4279
Simmons, J. A., 2585, 2586
Simonov, I. N., 1239
Simons, A. J., 4494a
Simons, J. N., 3849
Simons, R. K., 154, 2273
Simpson, J., 3491
Sims, A. J., 366
Sinclair, W. B., 3100p
Sinden, J. W., 2713, 2730, 2732, 2739
Singer, S. J., 1145e
Singh, H. N., 3745
Singh, K. K., 925, 2002, 4187, 4283, 4347, 4443
Singh, L. B., 3030, 3266, 3267
Singh, M. P., 3040
Singh, R. N., 1017o, 3173, 4447p
Singh, R. S., 1592
Singh, S., 3492
Singh, S. N., 2243
Singh, U. P., 4264y
Singleton, G., 3801
Singleton, K. G., 2922c
(Singleton, W. S.), 2904
Sirdeshmukh, K. B., 1813r
Sironval, C., 2337
Sites, J. W., 3049, 4193, 4215
Sitton, G. R., 822
Sivadjian, J., 79z, 80a
Sivaramakrishnan, V. M., 3444i
Sivec, S., 2882
Skellam, J. G., 2133
Skellon, J. H., 1734
Skepper, A. H., 3017
Skiles, R. L., 372z
Skinner, H. R. W., 3696
Skolko, A. J., 421, 2698
Skoog, F., 36, 2845
Skripov, I. V., 3770
Škropin, P., 2322o
Ślaski, J., 1187
Sleeth, B., 3052, 3057, 3067, 3100q
van Slogteren, E., 4163b
Smallwood, N. W., 1145q, 1145r
Šmargonj, E. N., 2913
Smeets, L., 1106
Smirnoff, W., 4240
Smirnov, N. A., 3426
Smit, B., 1435o
Smith, A. J., 1912o
Smith, A. M., 3290
Smith, B. C., 2997
Smith, C. B., 39
Smith, C. F., 1435p, 3657
Smith, C. L., 2386
Smith, C. N., 1233
Smith, F. F., 518, 701, 719, 735l, 3011d
Smith, F. L., 3859
Smith, G. F., 1108
Smith, G. L., 3433
Smith, H. C., 284
Smith, J. D., 2975, 2976
Smith, K. M., 3323n
Smith, L. C., 1311
Smith, L. M., 3701
Smith, M. A., 1540, 3896
Smith, N. M., 3229
Smith, O., 2566
Smith, P. F., 769, 774, 1838, 4198, 4200, 4213
Smith, P. G., 537, 2624
Smith, P. M., 2703
Smith, R. H., 2032, 2033, 4447q, 4447r
Smith, R. J., 450, 530, 3100r, 4244
Smith, R. J., Jr., 1451
Smith, W. L., Jr., 294, 3615, 3819
Smock, R. M., 2223
Snapp, O. I., 1396, 2546h
Sneep, J., 1524, 1648a, 3764
Snethlage, P., 3108
Snijders, J. H., 22
Snoad, B., 1813t
Snow, R., 1742r
Snyder, E., 2365
Snyder, F. W., 1439
Snyder, H. R., 4068u
Snyder, W. C., 1435f, 3905
Société Pomologique de France, 3319
Society of Chemical Industry, 248, 1052
Sockalingam, T., 1942
Soenen, A., 335, 1338, 1392
Sogabe, T., 803
Sokolova, V. E., 138
Solari, M., 2720
Solaroli, V., 2453, 2492
Solomon, M. E., 1422
Solovjeva, M. A., 2322p
Solovjeva, N. N., 3995
Somos, A., 1532, 1534
Sørensen, H., 80b
Sörgel, G., 2700
Sorteberg, A., 3903
Sosa, A., 3572o
Sosa-Bourdouil, C., 3572o
Soures, B., 3791
South African Sugar Association, 2038
South Australia, Botanic Garden, Adelaide, 3323o
Southern Rhodesia Tobacco Research Board, 552, 1651, 1662, 1666, 1671, 2841
Southwick, F. W., 181, 533
Soyer, L., 835
Spagnoli, A., 201r
Spangelo, L. P. S., 3539q, 3539r
Spanner, D. C., 1100
Sparrow, A. H., 1095
Spear, I., 3443j
Specht, A. W., 774, 4198
Speer, R. J., 1573
Spence, J. A., 4398
Spence, J. W., 1734
Spencer, D., 3928
Spencer, E. L., 1546, 1634, 1648b, 3934
Spencer, H., 2018, 3062, 3063, 4237, 4238
Spencer, J. E., 595
Spencer, R. T., 2838x
Speyer, E. R., 543d
Speyer, W., 472
Spickett, R. G. W., 4163c
Spijkman, L., 2208t
Spikes, J. D., 3361
Špilenja, S. E., 1708, 1709, 1717, 2874
Spillner, E., 4446b
Spina, P., 812, 816, 832s, 2684
Spivakovskiĭ, N. D., 1204
Spoelstra, P. A., 1136, 2725
Spoon, W., 4307, 4357
Sporer, A. H., 1145s
Spray, J. R., 403
Spreafico, L., 404a
Spreng, H., 168

Sprenger, A. M., 2254
Sprinks, F. O., 3252
Sproston, T., Jr., 2919
Spurlock, A. H., 1489
Spyros Paraschis, M., 616
Squires, J. A., 2894, 4163c, 4447i
Sreenivasaya, M., 1742b
Srinivasan, M., 543i, 1721, 4446w
Srivastava, A. N., 1696
Srivastava, S. N. S., 735v
van Staalduine, D., 3754
Stace-Smith, R., 1334, 3636
Staehelin, M., 139, 1322
Stafford, E. M., 2503, 4261
(Stahl, C.), 1061g, 3323d
Stahler, L. M., 3692
Stalder, L., 1356
Stamper, E. R., 398, 1476, 3744
Stančevič, A., 3592
Staniland, L. N., 1776
Stant, M. Y., 602
Stanton, D. J., 2817
Stanton, W. R., 286
Stapley, J. H., 3690s
Stapp, C., 2546i, 3333
Stark, E. W., 2395s
Starnes, O., 2831
Starr, G. H., 3956k
Starý, F., 4068v
Statens Forsøgsvirksomhed i Plantekultur, 2501, 2546j, 2790, 3609, 3610
Statens Plantepatologiske Forsøg, 2396
Steeves, T. A., 2151
Steffen, L., 735w
Stehlé, H., 4400
Steib, R. J., 4405
Stein, G., 416
(Steinberg, J.), 4471
Steinberg, R. A., 577c, 1660, 1697m
Steindl, D. R. L., 983, 4407
Steiner, M., 2889, 4021
Steingruber, P., 2381
Steiniger, F., 1409
Steinmetz, E. F., 2094
Steinmetz, H., 3572p
Stellwaag, F., 278, 337, 1304, 2438
Stenmark, A., 325
Stenning, L., 2025
Stepanov, K. M., 4225
Stepanov, S. N., 3474
Stephen, R. C., 3999
Stephens, R., 2564
Stephens, T. S., 3100i
Stępniewska, K., 3655
Sterling, C., 1236q, 3009, 3869
Stevens, W. L., 1017p
Stevenson, E. C., 496
Stevenson, G. C., 4366
Stevenson, I. L., 159
Stevenson, J. A., 912
Steward, F. C., 2142, 4279
Stewart, C. W., 4369
Stewart, I., 1840, 3100s, 4201
Stewart, W. S., 4264z
Stinson, F. A., 1651, 1662, 1666, 1671, 2841
Stinson, R. F., 624, 2943
Stirnberg, A., 2208c
Stirrett, G. M., 1697h
Stitt, L. L., 2498, 3787, 3899
Stobwasser, H., 3690t
Stockbridge House Experimental Horticulture Station, 4479
Stoev, K. D., 1276
Stoïanova-Ivanova, B., 4018
Stoll, K., 1219, 3533
Stoller, B. B., 2714
Stolp, D. W., 2209a
Stolp, H., 38
Stone, H. M., 2825
Stone, J. D., 3701
Stone, L. E. W., 1759
Stone, M. W., 2650, 3871, 3955y
Storer, T. I., 1404
Storey, I. F., 436, 2699, 3874
Storey, W. B., 810, 2010, 3269u, 4253, 4264o, 4265a
Storrs Agricultural Experiment Station, Connecticut, 1061e, 2097
Storrs, E. E., 3788
Story, G. C., 3202
Stoughton, R. H., 3539s, 4163d
Stout, G. L., 3593, 3690u, 3690v, 3759, 4265b
Stoutemyer, V. T., 1781, 1813u, 2169, 2972
Stover, R. H., 851, 1017q, 1017r, 4282
Strachan, C. C., 1236b
Strain, H. H., 2139
Strajin-Tomič, B., 265
Stratton, C. L., 353
Strauss, E., 209, 3572q
Street, A. T., 3438
Street, H. E., 80c, 508, 1105, 1116, 1648c, 3921
Strickland, A. G., 1072
Stritzke, S., 2392
Strmecki, E. L., 3404
Stromberg, V. L., 2877
Strømme, E., 4132, 4133
Struys, L. C., 50
Strydom, E., 2631
Stuart, N. W., 674, 678, 679, 2968
Stubbs, L. L., 3904
Stucky, A., 2314
Stugard, B., 4217
Sturdy, M.. 218, 408
Sturgess, O. W., 3621
Sturgis, M. B., 4381
van Stuyvenberg, J. H., 85
Suárez de Castro, F., 3158
Subba Rao, A., 3270o
Subba Rao, M. S., 79t, 4379
Subbayya, J., 3539t
Subramanian, C. K., 3100t
Subramanian, D., 2834, 2838m
Subramanian, N., 4446w
van Suchtelen, N. J., 1993
Sudan, Ministry of Agriculture, Research Division, 2119j, 3312
Sudds, R. H., 3670
Sugawara, T., 3396, 3975
Sugiyama, T., 255, 417, 3549
Suit, R. F., 1865, 3016, 4226
Sullivan, D. T., 2306
Sullivan, W. N., 3689q
Summerland, S. A., 344
Sun, V. G., 971, 976, 1017s, 4388
Sundaram, S., 920
Sunday, M. B., 1847
Sundqvist, S., 2785
Susini, E., 735x
Süssbrich, H., 446
Sussex, I. M., 3921
Sutcliffe, J. F., 3370
Šutić, D., 2827
Suzuki, K., 2297
Svjatelik, N. A., 593
Swain, T., 661
Swamy, A. Y., 4309
Swank, G., Jr., 1547, 3822
Swanson, C. A., 2176
Swanson, C. L. W., 1124
Swanson, C. P., 1813v
Sweet, R. D., 2600, 2609, 2611, 2612, 2618
Swift, J. E., 1523
Swingle, M. C., 1446
Swirski, E., 794
Syamal, N. B., 2395t
Sykes, M. T., 1223
Sykes, S. M., 1225, 1226
Sylvain, P. G., 4447s
Sylvester, E. S., 3936
Sysoev, A. T., 1877
Szalay-Marzsó, L., 2508

T., H., 3270p
Tabayoyong, F. T., 1017b
Taboada, O., 3334
Taboada, V. L., 1831, 1860
Tai, E. A., 3013, 3020
Taiwan Sugar Experiment Station, Plant Breeding Department, 968
Talbert, T. J., 1032
Talboys, P. W., 4044
Tamashiro, M., 2704
Tamir, P., 171

Tanada, A. F., 844
Tandon, S. L., 4163e
Tang, C. K., 4394
Tanganyika Coffee Research and Experimental Station, Lyamungu, 1980, 4324
Tanganyika Government Chemist, 4447t
Taniuchi, T., 2640
Tanner, H., 3536
Tapley, R. G., 917
Tapley, W. T., 505
Tarantola, C., 3392
Tarasenko, M. P., 113, 1185
Tarr, H. L. A., 1216
Tarr, S. A. J., 1033
Tarragan, M., 2806
Taschenberg, E. F., 328
Tashiro, H., 3641
Tasmanian Department of Agriculture, 2951
Tassinari, M. M., 3616
Tatchell, A. R., 607, 1731
Tatebe, T., 543j
Tattershall, J. T., 4095
Tauber, O. E., 3850
Taylor, E. A., 3836
Taylor, E. H., 1145o, 2197
Taylor, G. S., 411, 573
Taylor, O. C., 2310, 3100a
Taylor, W. E., 4061
Tea Research Institute of Ceylon, 998
Teague, C. P., 3031
Tegethoff, B., 1145t
Teich, Y., 824
Temme, J., 1572
Templa, M. A., 3270q
Templeton, J. K., 3724
Tendolkar, G. S., 1017t
Tenembaum, J. L., 2905
Ten Houten, J. G., 43, 1343
Tepe, W., 4163f
Terentjeva, M. V., 3930
Termohlen, G. P., 201s
Terra, G. J. A., 840, 3107
Terrier, C., 1322
Teubner, F. G., 175, 189
Teubner, F. G., Jr., 2296
Teuscher, H., 704
Tew, R. P., 3628
Tewfik, S., 2635
Thakar, C., 3745
Thakoor, N. R., 1017t
Théau, —., 1751
Thellet, B., 3622
Thermes, R., 3789
Thiel, K., 3468
Thiele, K. P., 620, 1034
Thiele, V. K., 2418
Thiem, E., 3647
Thiem, H., 1211, 1433, 1435q, 1435r, 3690w
Thimann, K. V., 1145k, 2578, 3394, 3443j
Thiollière, J., 3622
Thomas, D. G., 4338
Thomas, D. W., 1129
Thomas, H. E., 2324, 2436
Thomas, L. A., 114, 2249
Thomas, M., 1145u
Thomas, N. F., 3945
Thomas, P. K., 892
Thomas, W., 39
Thomas, W. D., Jr., 1813h, 2937
Thomas, W. D. E., 366, 2177, 2812, 2813
Thompson, A. H., 145, 1165, 2286
Thompson, E. C., 3467
Thompson, F. B., 3696
Thompson, F. C., 4042, 4043, 4047
Thompson, H. A., 3224
Thompson, J., 3722
Thompson, W. L., 1872, 1873, 3061, 4219, 4230
(Thompson, W. R.), 2545d
Thomson, B. F., 3844
Thomson, R., 401, 1697n
Thorne, D. W., 2147
Thorne, G. N., 2636
Thornton, N. C., 1017r
Thorold, C. A., 1960
Thresh, R., 27
Ticó Roig, L., 2906
Tidbury, G. E., 1917, 4270
Tihonov, N. N., 1236r
(Tilford, P. E.), 4494g
Till, J. F., 3733
Timberlake, C. F., 213, 370
Tincknell, R. C., 3741
Tindale, G. B., 2320
Tinley, J. M., 3100r
Tinsley, T. W., 437, 1680, 4304
Titus, J. S., 143, 146
Tjaželjnikov, A. D., 90
Tjutin, M. G., 3949
Tjutjunik, A. F., 1278
Tkačenko, F. A., 1557, 2677, 2838y
Tkačenko, G. V., 2370
Tobacco Research Board of Southern Rhodesia, 552, 1651, 1662, 1666, 1671
Tocklai Experimental Station, 4493
Tocquigny, J. R., 1448
Todd, B. J., 3765
Todd, F. A., 3990
Togliani, F., 373a, 373b, 373c, 2402
du Toit, J. L., 963, 3210
Tolba, M. K., 1641
de Toledo, A. A., 3654
Tolhurst, J., 148, 156
Tollenaar, D., 3270r
Tomažič, G., 2882
Tombesi, L., 17, 2849, 4000
Tometorp, G., 3762
Tomkins, J. P., 2372
Tomkins, R. G., 2322q
Tomlinson, J. A., 1296
Tomova, M., 584
Tonnier, J.-P., 4005
Toohey, C. L., 2079i
Toovey, F. W., 926, 933
Topor, J. A., 3484
Torgeson, D. C., 2995, 4150
Torii, H., 4438
Torres, F. G., 2902
Torres, J. P., 4031
Torrey, J. G., 32
del Tosta Filho, I., 1932
Toth, S. J., 412, 1118, 2146, 3399
Toumanoff, C., 3667
Townsend, J. F., 3631
Toxopeus, H. J., 4030
Trébuchet, G., 1565
Treccani, C. P., 2318
Treggi, G., 3865
Trenkle, R., 1179
Tresch, —., 460
Trickett, E. S., 2536
Trickett, R. S., 693
T[rinick], J. M., 3270j
Trinidad and Tobago Department of Agriculture, 2079j
Trinidad and Tobago Director of Agriculture, 839, 3313
Trivelli, G., 367
Trojer, H., 1986
Trout, S. A., 1225, 1226, 1930
Troxel, A. W., 519
Troxler, R. V., 517
Trulevič, V. K., 3802
(Trullinger, R. W.), 4489
Truog, E., 2208h
Trupin, F., 3435
Truscott, J. H. L., 3531
Trusevič, G. V., 3484
Trzcinski, T., 2269
Tsai, T. K., 988, 990
Tschermak-Seysenegg, E., 1763
Tseng, P. M., 4394
Tsukamoto, Y., 2931
Tubbs, F. R., 2590
Tucker, R. W. E., 4447u
Tuckett, A. J., 3759p
Tuft, T. O., 529
Tukey, H. B., 697
Tukey, L. D., 1438
Tukey, R. B., 183
(Tuller, W. N.), 4455
Tumanov, I. I., 766
Tunblad, B., 262, 325, 1373
Tunis, W. D., 3670

Tunisie, Service Botanique et Agronomique [S.B.A.T.], 4487
Tupikov, M. A., 2395u
Turian, G., 2479
Turica, A., 1386, 1912p
Turković, Z., 1295k, 2395v
Turnbull, J., 1374
Turner, H. E., 4153
Turnipseed, G. F., 3657
Turrill, W. B., 677
Turžova, M. P., 1279
Twyman, R. C., 542o, 2838z
Tydeman, H. M., 3476
Tysser, H. F., 2111

Ubrizzy, G., 372w
Ueno, Y., 3955u
Uganda Department of Agriculture, 4494k
Uhlig, S., 1086, 3690x
Uldal, B., 4103
Ulevitch, I. N., 1017d
Ulrich, R., 201t, 1191
Underwood, J. C., 782
Unger, K., 502, 2700
United Planters Association of Southern India (U.P.A.S.I.), 999, 1002, 1012, 4494l
Universidad Central del Ecuador, 2118
Unruh, M., 249
Uota, M., 187, 188
Upshall, W. H., 3510
Urbach, G. E., 1212
Urhan, M., 906
Urquhart, D. H., 4286
U.S. Department of Agriculture, 1035, 1053, 1054, 1066, 1648d, 2122, 2397, 2654, 2861, 3200, 3291, 3326, 4488, 4489, 4490
U.S. Department of Agriculture, Bureau of Agricultural Economics, 3766
U.S. Department of Agriculture, Foreign Agricultural Service, 4265c, 4322, 4323
U.S. Department of Agriculture Tobacco Branch, 548
Usher, G., 4304
Usik, G. E., 2669
U.S. Interdepartmental Committee on Pest Control, 3690y
Usman, S., 3270h
Uzziel, M., 1853

Vail, W. A., 3690h
Vaile, J. E., 1252, 3560
Valat, C., 2354
(Valdeyron, G.), 4494m
Vallaeys, G., 1938, 1995, 4327
Vallance, L. G., 2079k
Valle, T., 3782
Valleau, W. D., 2557, 3989
Vallecilla, C. A., 870
Valsechi, O., 2911
Vanderford, H. B., 4265d
Vanderwalle, R., 2112
VanLeeuven, E. R., 2533
Vanstone, F. H., 3444j
Varadarajan, B. S., 3100t
Varadhan, C., 615n
Varier, N. S., 900
Varley, G. C., 1423
Varma, P. M., 578, 615f
Varney, E. H., 2458
Vaščenko, S. F., 2672
Vasil, I. K., 4163e
Vasiljev, A. V., 2928
Vasseur, R., 322, 345, 347
Vasyutin, Y. F., 4449
Vaughan, E. K., 1334, 1602, 2839c
Vaughan, J. G., 1813w
Veerman, J. A., 1778
Veerman, W., 2502
Vega, J., 233, 1266, 1269
Veiga, A. A., 96
Veiga, A. de A., 4335
Veksthusforsøksfondets Komité for Prøvedyrking av Chrysanthemum, 4163g
Velazquez Diaz, J., 4265e
Veldstra, H., 3377
Velly, J., 1017u
van der Ven, L. F. J. M., 2842
Venjjaminov, A. N., 1158, 2238
Venkatachalam, V., 920
Venkataramani, K. S., 2746, 4434, 4447v
Venkataratnam, L., 3105
Venkatesh, C. S., 4163h
Venkateswarlu, P., 3388
Ventura, T., 2079l
Venugopal, S., 3140
Verduin, J., 1098
Verdura, R., 4001
Verduyn, H. A., 1724
Vergani, A. R., 1874, 1879
Vergara Castillo C., 1336
Verghese, E. J., 892
Vergnes, A., 3623
Verkerk, K., 3799, 3886
Verona, O., 3292
Vervloet, C., 1017v, 3270s
Verzele, M., 4048
Vesey-Fitzgerald, D., 1975
Vettori, M., 2374
Vetušnjak, L. F., 1550
Vibstad, A., 2788
Vicente, S., 3671
Vickery, H. B., 2867c
(Vickery, L. S.), 3958
Victor, —., 3436
Victor, B., 76
Victoria Department of Agriculture, 81
Vidal, J.-P., 226
Viel, G., 372x, 2521, 2522
Viennot-Bourgin, G., 543k
Vieregg, A., 542q
Vierheller, A. F., 1165
Viets, F. G., Jr., 2693, 2694
Vijayasaradhy, N., 4391
Vilardebo, A., 1919, 1928
Villanova M., T., 919
Vince, D., 4163d
Vincent, L. E., 808
Vineland Horticultural Experiment Station, 4484
(Vines and Wines, Seventh International Congress), 2346
Viney, R., 2120
Vink, A. P. A., 3193
Vinnik, A. G., 1550
Vinogradov, P. I., 501
Vinokur, R. L., 4205
Virelizier, P., 2908
Virgin, H. I., 3444k
Virtanen, A. I., 80d
Visschers, A. J., 1151
Visser, T., 2263, 3459
Vitagliano, M., 556
Vittorio, P. V., 3976, 4003e
Vittum, M. T., 505
Vituškina, I. V., 3100u
van der Vliet, M., 1585, 1648e, 3882
Vlitos, A. J., 1441, 3381, 3382
Voblikova, T. V., 1850
Vodopivec, S., 2882
Voelcker, O. J., 1937
de Vogel, P., 724
Vogel, W., 1394, 3581
Volcani, R., 832t
Volcani, Z., 3938
Volk, G. M., 1659, 1689
Volk, R., 3974
Vollema, J. S., 2023
Volodarskiĭ, N. I., 3977
Vorževa, L. V., 2221
Vos, H., 3897
Vos, H. C. C. A. A., 440
Vouk, V., 2208d
Vreeken, C. N., Sr., 2839a
van de Vrie, M., 2546k
Vriend, S., 448
de Vries, D. A., 3363
de Vries, J. T., 723
Vrijhof, B., 173
Vučenović, A., 2546l
Vuillaume, M., 1919
Vuittenez, A., 2439
Vyvyan, M. C., 3475

van der Waal, M. A., 2783
Waddell, C. W., 980, 4424
Wade, G. C., 290

Wade, P., 3417
Wadleigh, C. H., 153
Wadsworth, R. V., 1932, 4306
Wagener, W. W., 2448
Wageningen, "de Lange Ossekampen", 2119g
Wageningen, Instituut voor Tuinbouwtechniek, 373d, 1058, 1067
Wageningen, Instituut voor de Veredeling van Tuinbouwgewassen, 4472
Wageningen, Plantenziektenkundige Dienst, 1401, 1410, 1583, 1699, 2119k
Wager, V. A., 1648f
Waggoner, P. E., 1639, 1640
Wagnon, H. K., 3595, 3690v, 3759
Wahid, M. A., 4405
Wahl, I., 2712, 3938
Wahlin, B., 1427
Wain, R. L., 1419
Wainstein, P., 590, 1559, 1561, 1714
Waite Agricultural Research Institute, 2119l
Waite Agricultural Research Institute, Department of Entomology, 1785
Waite, B. H., 850
Wakil, A., 3739
Waldo, G. F., 208
Walker, A. H., 3731
Walker, E. A., 2563, 2620
Walker, J., 4097
Walker, J. C., 1509, 1528, 1598, 3848
Walker, J. H., 3539u, 3539v
Walker, T. K., 1732
Walkof, C., 3956l
Wallace, A., 708, 742, 744, 771, 2175, 2186, 3034, 4168, 4194
Wallace, J. G., 2839b
Wallace, J. M., 832u, 1816, 3051
Wallace, J. O., 1609
Wallace, T., 80e, 3293, 3444l
Wallen, V. R., 421, 2698
Wallihan, E. F., 775
Wallin, J. R., 2193
Walter, J. M., 1647r, 3955x
Walter, N., 4447w
Walter, T. E., 1004
Walters, H. J., 3956k
Walzel, G., 1742s
Wander, I. W., 4193
Wang, C. C., 4395
Wang, C. H., 1145v
Wang, M. Y., 2188
Wang, S. C., 975, 4447x
Ward, J., 2922k
Ward, J. B., 2894
Ward, J. R., 290
Ward, R. K., 3759p
Wardlaw, C. W., 543l
Wareing, P. F., 1145w
Waring, E. J., 435
Warington, K., 2138, 3405
Warne, L. G. G., 485, 1486
Warnock, S. J., 3843
Wartenberg, H., 3333
Washr, P., 1742k
Wasowicz, T., 1939
Wasowicz, T. E., 865, 4295
Wasscher, J., 4163i
Wassenaar, L. M., 3572r
Watanabe, H., 463, 2686, 3855
Watanabe, I., 444
Watanabe, K., 2480, 2977
Waterhouse, A. D., 3222
Waterston, J. M., 937
Watson, D. P., 633, 644, 673, 2745, 3820
Watson, M. A., 3810
Watson, R., 132
Watson, R. D., 1580
Wattle Research Institute, 2119m
Watts, A. T. J., 131
Way, M. J., 2703, 3146, 3147, 4320
Waygood, W. A., 591
Waywell, C. G., 2576, 2588, 3734
Weathers, L. G., 565, 3053
Weaver, L. O., 283
Weaver, R. J., 236, 2379
Webb, D. v. V., 1736
Webber, E. R., 2205, 2828
Weber, P. V. V., 2769
Webster, G. R., 55, 62, 3416, 3422
Wedding, R. T., 779, 3047
Weed, R. M., 1435s, 3710
Wegenaar, C., 3662
Weger, N., 2800
Wehunt, R. L., 1209, 2266
Weick, F. E., 3439
Weijel, M. L., 1752
Weinhausen, K., 3271
Weinstein, L. H., 3408
Weintraub, R. L., 3380
Weiss, L. C., 921
Weissenborn, K., 144, 2282
Welch, H. V., Jr., 2175
Welch, J. E., 2624, 2773
Welch, J. F., 2546m
Welecska, —., 71
Wellendorf, M., 1648g
Wellensiek, S. J., 2933, 3886
Weller, L. E., 2209b
Wellesbourne, National Vegetable Research Station, 3956m
Wellman, F. L., 1994
Wells, D. A., 58
Wells, J. S., 705, 711, 718, 731, 734, 1796, 1812, 3428
Wender, S. H., 201w, 3572s, 3834, 4356
Wene, G. P., 2655, 2709, 2836
Went, F. W., 3444m, 3444n
Wenzl, H., 295
Wertheim, A., 1632
Wesley, R., 2551
Wessel, G., 1120
West, E. S., 1834
West African Cacao Research Institute (W.A.C.R.I.), 854, 855, 856.
West African Institute for Oil Palm Research, 1060, 3174, 3175
West of Scotland Agricultural College, 3317
Westenberg, M. G., 3188
Wester, R. E., 1125
Westerhof, J. J., 1122
Westgarth, D. R., 950, 962
Westgate, P. J., 1502
Westlake, W. E., 2542
de Wet, A. F., 117, 1161
de Wet, J. M. J., 1765
van Wetswinkel, G., 1392
Weybrew, J. A., 1694
Weydahl, E., 2751
Whitaker, T. W., 542b, 1613, 2774
White, D. G., 182, 3458
White, D. J. B., 3353, 3354
White, E. P., 4068w
White, E. V., 1017w
White, P. R., 80f
White, R. G., 4295
White, W. E., 3440
Whitehead, S. S., 2621j
Whitehouse, W. E., 243
Whiting, A., 4163j
Whiting, F. L., 757
Whitner, B. F., Jr., 3956n
Whitney, J. B., Jr., 2176
Whitsell, R., 749
Wiant, D. E., 3334
Wiant, J. S., 514
Wichers, A. J., 80g, 193, 201u, 543m
Wickens, R., 1967
Wickremasuriya, C. A., 895
Widdows, J. O., 1003
Widdowson, F. V., 413
Widhelm, H., 3565
Widmer, R. E., 722
Wiebe, J., 405, 2808
Wiedow, H.-L., 28
Wiegand, K., 2180
Wiehe, F., 4446v
Wiersum, L. K., 1017x, 3190
Wierszyłłowski, J., 1169, 3740
Wiggans, S. C., 3888
Wiggins, L. F., 2065, 3270t

Wight, W., 3243
Wijeratne, W. M., 549, 1675
Wijewardene, R., 4316
van Wijk, W. R., 3363
Wikesjö, K., 1406
Wilcox, J., 3956o
Wilcox, J. B., 80h
Wilder, E. A., 4068x
Wildman, S. G., 1145e, 3443o
Wilhelm, A. F., 2546n, 3625
Wilhelm, S., 1697o, 1749, 1758, 2324, 2941, 4175
Wilkinson, E. H., 3605, 3619
William, A., 2737
Williams, A. E., 53, 2383
Williams, A. H., 201v, 1236i
Williams, B. C., 2179
Williams, B. L., 201w, 3572s, 3834, 4356
Williams, C. G., 3091, 3184
Williams, E. B., 285
Williams, G., 879, 1962
Williams, J. R., 3237, 4413
Williams, K. T., 80i, 3931
Williams, O., 1438
Williams, P. H., 452, 522, 523, 528
Williams, R. F., 3350
Williams, R. O., 886
Williams, R. R., 130
Williams, T. R., 2209c
Williams, W. T., 2674
Williamson, C. E., 636, 1755
Williamson, J., 735y
Willis, A. J., 2161
Willits, C. O., 577f
Willmott, P. K., 86
Wills, J. M., 1920
Wilner, J., 1184
Wilson, D. J., 1254, 3553
Wilson, J. D., 543n, 3826
Wilson, J. F., 4044
Wilson, J. W., 1648h
Wilson, R. A., 357, 372l
Wilson, R. W., 1673
Wilson, T. B., 3226
Wilson, W. F., 3956p
Wilson Jones, K., 2572
Wiltshire, G. H., 1575, 1648i
Winchester, J. A., 1458
Wing, R. E., 1103
Winkler, —., 3689w
Winkler, E., 19
Winoker, J., 4249
Winslow, M. M., 832v, 832w, 3012, 3100v, 3100w
Winsor, A. P., 3574
Winter, E. J., 58
Winter, H. F., 2446
Winters, H. F., 1014, 3268
Wisconsin Agricultural Experiment Station, 1059, 1061r, 2113
Wise, C. T., 2079m
Wise, K. J., 5430
Wishart, R. L., 2820
Wishnetsky, T., 532
Wismer, C. A., 4447y
Withrow, A. P., 80j
Withrow, R. B., 80j
Witrant, R., 4265f
de Witt, K. W., 869, 881, 1968, 1969
Witte, K., 68, 1313, 3294, 3923
Wittwer, M., 497
Wittwer, S. H., 1617, 2209b, 2754, 2939, 3820
Woess, F., 1495
Wohlmuth, N., 1295d, 2208p
Wolcott, G. N., 4411, 4447z
Wolf, B., 4074
Wolf, D. E., 2558
Wolf, W. D., 563
Wolfe, H. R., 2432, 3597
Wolfenbarger, D. O., 2018
Woltz, S. S., 4106
Woltz, W. G., 1484, 1673, 1676
Wong, P. S., 3397
Wood, C. A., 2334, 3544, 3548
W[ood], D. J., 3270j
Wood, J. G., 3391
Wood, R. D., 1507
Woodcock, D., 1417
Woodford, E. K., 376, 2561
Woodhams, D. H., 3860
Woodhead, C. E., 3472
Wooding, N. H., Jr., 61
Woodroof, J. G., 2388
Woods, J. J., 4491
Woodward, H. C., 2313
Wooley, P. H., 1334, 1353
Woolman, J., 1036
Woon, P., 3584
Worley, D. P., 2577
Wormald, H., 3612
Wort, D. J., 3385
Woudenberg, J. P. M., 730
Wright, D. W., 1543, 3815, 3816, 3894
Wright, S. J., 1006
Wright, W. J., 1527, 1533
Wright, W. R., 3896
Wulff, H. D., 4163k
Wurgler, W., 139, 387, 2291
Wye College Department of Hop Research, 4039
Wyman, D., 4138
Wynd, F. L., 3987

Yakiwa, T., 476
Yale, J. W., Jr., 1602, 1606, 2839c
Yamada, T., 656
Yamaguchi, M., 543p
Yamaoka, A., 4068d
Yamato, M., 2336
Yang, C. C., 975
Yang, T. C., 966
Yankovitch, L., 3779
Yarwood, C. E., 1101, 3617, 3866
Yashiro, H., 255
Yashiroda, K., 1792
Yates, R. E., 244b
Yeates, J. S., 712, 732
Yee, W., 4101
Yemm, E. W., 2161
Yeoman, A. H., 2533
Yoder, J. B., 2732
Yoffe, J., 1859
Yost, H. T., Jr., 1813v
Young, H. C., 2446
Young, H. E., 951
Young, H. Y., 381
Young, P. A., 2818, 3943
Young, R. A., 4150
Young, R. E., 3518
Youngken, H. W., Sr., 4068y
Younkin, S. G., 2769
Yuncker, T. G., 4068z, 4155
Yusuf, N. D., 3216, 4386

Zaar, É. I., 1809
Zabavskaja, K. M., 3371
Zachos, D. G., 1578
Zaharova, E. I., 1316
Zaheer, S. H., 1017m
Zaitlin, M., 4163l
Zakarija, A., 3089
Zaliwski, S., 1205
Zanzibar Department of Agriculture, 883
Zaumeyer, W. J., 470, 2697, 2839d
Zavackaja, E. A., 1193
Ždanova, L. P., 4057
Zdruĭkovskaja, A. I., 109, 2258
Zechmeister, L., 1089
de Zeeuw, A., 64, 423
de Zeeuw, D., 80k, 1093
Železnova-Kaminskaja, M. A., 4140
Zenker, A., 2165
Zentmyer, G. A., 750, 832x, 832y, 1817, 4173, 4174, 4175
Zeumer, H., 1416
Zielinski, Q. B., 3539w
Zillig, H., 220
Zimmerman, L. H., 4058
Zimmerman, P. W., 2621k, 3011y, 3376
Zimmermann, J., 2362, 2395w
Zinkiewicz, J., 1631
Zippelius, H., 2095
Živanović, V., 2513
Živojinović, S., 2507
Zlatkovsky, A., 1526
Zobrist, L., 299, 2530
Zohary, M., 2389
Zonderwijk, P., 1479, 3695
Zorin, F. M., 3024

Zoz, I. G., 2873
Zuberbühler, —., 4163m
Zucchini, M., 201x
Žučkov, N. G., 3505
van Zuilen, E. J., 4431
Zukel, J. W., 2545m
Žukov, N. I., 577g
Žuljević, I., 265
Zuluaga, P. A., 1265, 1268, 2366
Zuñiga, L. C., 4313
Zwintzscher, M., 3539x

# SUBJECT INDEX

## Horticultural Abstracts, Vol. XXIV

Abacá (*Musa textilis*)—*see* Manila hemp
*Abelia* spp., nutrition, 4274
*Abeliophyllum* sp., propagation by marcotting, 1794
*Abroma augusta*, 598, 599, 834, 3104
Abscission—*see* Branch, Growth substances *and* Leaf
*Abutilon* diseases, 2987
*Acacia*—*see also* Wattle—
  *arabica*, 1707
  *farnesiana*, 2922a
  *prominens*, 4068w
  *senegal*, 841, 4067
  spp. as shade for coffee, 4333
*Acalymma trivittata*, 456
*Acanthoscelides obtectus*, 3334
*Acanthosicyos horrida*, 1698
Acaricides—
  aramite (2-(*p-tert*-butylphenoxy)isopropyl 2-chloroethyl sulphite), 1878
  butoxypolypropylene glycol, 3627
  *p*-chlorbenzyl *p*-chlorphenyl sulphide (Chlorocide), 311, 1428, 1429
  chlorinated phenyl benzene sulphonates (CPBS, CPCBS, DCPBS), 2489, 3628, 3689u, 4145
  diazinon (Basudin), 1430
  4: 6-dinitro-2-*sec*-butylphenol (dinoseb), 3628
  ethylene bisdithiocarbamates, 3630
  oil sprays, 4231, 4233
  parathion, methyl parathion and related esters, 313, 314, 2546, 4483
  reviews on, 248
  schradan *or* OMPA (bisdimethylaminophosphonous anhydride *or* octamethylpyrophosphoramide), 2914, 4045
  sulphites, organic, 2545m
  systemic, 312, 314, 530, 1056, 1521, 2492, 2546j, 2914, 3677, 4045, 4148
  various, 529, 710, 1873, 2652, 2914, 3626, 3631, 3632, 3689b, 4127, 4236
*Acer pseudoplatanus*, 2988
*Acer* spp., propagation, vegetative, 711, 1794
*Aceria*—
  *ficus*, 1332
  *sheldoni*, 3060, 4231, 4233
  sp. on orchid, 4127
Acetate metabolism in plants, 14, 1145v
Acetylene treatment for ripening fruits, 1931
*Achaea lienardi*, 1736
*Achras sapota*—*see* Sapodilla
Acids, metabolism in plants, 1145u, 2079g, 3443d
Acids, organic, non-nitrogenous, determination, 4425
*Actinidia sinensis*—*see* Chinese gooseberry
Actinomycetes, antibiotics from, 3985
*Acyrthosiphon pisum*, 1581, 1582, 3849, 3850
Adelaide bot. Gdn, A.R., 3323o
Adenine, rooting of cuttings induced by, 1172, 3463
*Adenostoma fasciculatum*, 2621e
*Adiantum pedatum*, 2142
*Adonis vernalis*, 4068v
*Adoxophyes orana* (=*Capua reticulana*), 334, 335, 2545 l
*Aechmea fasciata*, 4162v
*Aegle marmelos*, 1013, 2078 l, 3267
Aeroplane, agricultural, 3439
Aeroplane application of fungicides, insecticides and herbicides, 372x, 2530-2532, 4465
Aerosol—*see* Insecticides
*Aesculus hippocastanum*, 4149
Africa—
  East—*see also* East African—
    coconut growing, 3141
    coffee research, 4446r
    tea growing, 3250
  French West—*see* French
  North—*see also* Algeria, Egypt *and* Morocco—
    apricot growing, 88
    bulb growing, 2955
    castor bean growing, 2907, 2908
    citrus growing, 4264n
    date growing and research, 3100h
    fruit growing and research, 201p, 2092, 3448
    geranium growing, 1718
    irrigation in, 163, 164, 3513
    lentil growing, 1567
    melon growing, 3832
    olive growing and research, 814, 3077, 3100c, 4264i
    rose growing, 1786
    strawberry growing, 1249
    tomato growing and varieties, 1618
    vegetable growing, 3956g
    vine growing and research, 2346, 2348
  South—*see* South Africa
  West, rubber growing, 4357
*Agalliana ensigera*, 1521
Agar production, 614, 4066
*Agaricus*—*see also* Mushroom—spp., taxonomy, 2711
Agassiz Dominion exp. Farm, Rep., 3295
*Agave*—
  *sisalana*—*see* Sisal
  spp., uses of, 598, 2868
  *vera cruz*, 1721
Agricultural—
  advisory services in Europe, 2126

- Agricultural (*continued*)—
  - books, American, 1145a
  - Conference, Proc. Inter-Amer., 4469
  - education in the British West Indies, 3327
  - education in Great Britain, 2208x
  - engineering, a review, 1052
  - periodicals in Latin America, 3332
  - research—
    - in the Belgian Congo, 3104
    - Center, Beltsville, Md, 1066
    - Index, Great Britain, 3296
  - statistics—
    - in Great Britain, 1078
    - in the U.S.A., 1053, 4488
    - Yearbook of food and, F.A.O., 3323g, 4470
- Agriculture—*see also* Horticulture—
  - in Argentina, 1
  - in the Far East, 1075
  - in Great Britain and the Commonwealth, 1069
  - in Latin America, 1073
  - in the Near East, 1074
  - in New Caledonia, 1077
  - tropical—*see* Tropical
  - in the U.S.S.R., 4449
- *Agriotes* spp.—*see* Wireworms
- *Agrobacterium rubi*, 3603
- *Agrobacterium tumefaciens*—*see* Crown gall
- *Agromyza clianthi*, 543o
- *Agromyza phaseoli*, 1647w
- *Agropyron repens* and its control, 1461, 2568
- Air—
  - conditioning—*see also* Storage—of buildings, 2725
  - layering—*see* Marcotting
  - pollution and plant injury, 43-46, 819, 1082-1085, 1325, 2414, 2546a, 3068, 3588, 4106, 4140, 4203
- Albinism, growth substances produce, 3699
- *Albizzia*—
  - *maranguensis*, 4333
  - *moluccana*, 1005
  - spp., diseases, 4340, 4341
- Alcohol from tamarind, 4446x
- *Aleurites*—
  - *fordii*—*see* Tung
  - *moluccana*, 841
  - *montana*—*see* Tung
- *Aleurocanthus woglumi*, 1056
- *Aleurodicus destructor*, 898
- Algae control on flower pots, 624, 4162r
- Algae control in ponds, 2571
- Algeria—*see also* Africa, North—
  - Louis Morard Cold Storage Res. Inst., 2121
  - Rap. Cons. Exp. Rech. agron., 2096
- Alkaloid(s)—*see also* Medicinal plants—
  - from *Acacia prominens*, 4068w
  - from *Adonis vernalis*, 4068v
  - apocynaceous, 2922b
  - from *Atropa* spp., 1708, 1709, 2922f, 4009
  - from calabash, 1742k
  - from *Chondrodendron* spp., 1711
  - contents, 2,4-D does not affect, 3711
- Alkaloid(s) (*continued*)—
  - from *Crotalaria* spp., 615a
  - from *Datura* spp., 1712, 2874
  - distribution in graft combinations, 1708
  - from *Glycosmis arborea*, 1742d
  - papaveraceous, 2876
  - from papaw, 4446p
  - from *Piptadenia peregrina*, 2877
  - from *Rauwolfia serpentina*, 2878
  - from *Senecio* spp., 615a, 615b
  - from *Spartium junceum*, 615 l
  - from *Strophanthus* spp.—*see Strophanthus*
  - synthesis, light affects, 1709
  - synthesis, plant nutrition affects, 4009
  - from tobacco—*see* Tobacco, composition
- Allelopathy in higher plants, 24
- *Allium*—*see also* Onion, *etc.*—spp., mycorrhizae, 2838w
- Allophylly in stone fruits, 1310
- Almond—
  - climate, spring frost, 129
  - diseases and disorders, 1347
  - growing in Italy, 237, 238
  - nutrition, salt injury and tolerance, 153, 2412
  - pests, insect, 3640
  - pollination, 129, 2385, 3570
  - rootstocks, 3469, 4487
  - varieties, 201p, 237, 238, 1159, 3572m
- *Alocasia* spp., culture, 4162y
- Alpine plants, diseases, 4080
- *Alternaria*—
  - *citri*, 793, 3073, 3074
  - *longipes*, 1678
  - *oleracea*, 1536
  - *raphani*, 1608
  - *solani*, 1636, 1637, 2819-2821
  - spp. on—
    - carrot, 2769
    - fig, 1355
    - okra, 1592
    - medicinal plants, 4008
  - *tenuis*, 3083
- *Althaea officinalis*, 4068r
- Aluminium nutrition of plants, 3036, 4074
- *Alyssum* varieties, 4079
- *Amaranthus*—
  - *gangeticus*, 4071
  - spp., as weeds, 2613
  - *spinosus*, 1088
- *Amateur Gardening Diary and hort. Directory*, 1061h
- *Amelanchier* spp., as food plants, 2322e
- *Amelanchier* spp., as pear rootstocks, 124, 1176
- America, Latin—
  - agricultural development, 1073
  - agricultural periodicals, 3332
  - strawberry growing, 1250
- *Ametastegia glabrata*, 341, 342, 1397
- Amino acids, determination, 3443n, 3443v
- Amino acids in plants, 80d, 2137, 2662, 3392, 4439, 4446w, 4447 l
- *Ammi visnaga*, 1734, 2873
- Ammonia content of melons, 3837
- Ammonia, persistence in sterilized soil, 52

- Ammonium, quaternary, growth regulating effects of, 2691
- *Amphicyrta chrysomelina*, 3011i
- *Amphimallon majalis*, 3641
- *Amphitetranychus viennensis*, 3690m
- *Amphorophora rubi*, 2434
- *Amphorophora rubitoxica*, 3636
- *Anagallis arvensis*, 3719
- Analytical methods—*see under individual chemicals and* Statistics
- *Anastrepha ludens*, 4264d
- *Anastrepha* spp. on citrus, 1869
- *Anethum graveolens*, 582
- Angola, flora, 3103
- Angola, plantation crops, 3299
- *Annona*—
  - *cherimola*—*see* Cherimoya
  - *muricata*, 2076
  - spp., cultivated, a review, 4440
  - spp., rootstocks, 3264
  - *squamosa* (custard apple), 3264
- Annual Reports—*see also* Reports *and* Yearbooks—
  - Algér. Cons. Exp. Rech. agron., 2096
  - Amsterdam—*see below*, Royal *and* Tropical
  - Aomori Apple Exp. Stat., Japan, 3539c
  - Arizona agric. Exp. Stat., 3323a
  - Australia(n)—
    - Canned Fruits Bd, 2119a
    - C.S.I.R.O., 1039, 4467
    - Dried Fruit Control Bd, 1295b
  - Barbados—*see also below*, British West Indies—Dep. Sci. Agric., 4461
  - Basutoland Dep. Agric., 3323b
  - Bermuda Dep. Agric., 1061b
  - Biol. Bundesanst. Land- u. Forstw. Braunschweig, 4462
  - Botanic Garden, Adelaide, 3323o
  - Botley Fruit Stat., 1244
  - British—
    - Columbia agric. Statistics, 3323c
    - Guiana Sugar Exp. Stats, 4446h
    - Honduras Dep. Agric., 4464
    - West Indies centr. Sugar Cane Breed. Stat., Barbados, 4367
  - California Dep. Agric., 4465
  - Cameroons Develop. Corp., 2119b
  - Canada, Dep. Agric. Fruit and Veg. Prod. Res. Cttee, 4466
  - Canada, Minist. Agric., 1037
  - Canterbury agric. Coll., N.Z., 1061c
  - Cawthron Inst., N.Z., 1038
  - Ceylon—*see also below*, Rubber—Dir. Agric. Administ., 833
  - Ceylon Tea Res. Inst., 998
  - Cheshunt exp. Res. Stat., 1061d
  - Coffee Bd Kenya, 4446u
  - Coffee Res. exp. Stat. Lyamungu, Moshi, 4324
  - Connecticut—*see below*, Storrs
  - Cyprus Dep. Agric., 1653, 2098
  - Danish—
    - Inst. Weed Res., 404e
    - Seed Testing Stat., 1061g, 3323d
    - Service Seed Path., 1061f

- Annual Reports (*continued*)—
  - Dir. Rech. agron. pastor., Viet-Nam, 1045
  - Dominica Dep. Agric., 3323e, 4494c
  - East African Agric. For. Res. Organ., 3323f
  - East Malling Res. Stat., 4468
  - Ireland, Republic of, Minist. Agric., 3323i
  - Florida agric. Exp. Stat., 2101
  - Friesdorf/Bad Godesberg gärtn. Versuchsanst., 1744
  - Geisenheim, Lehr- u. ForschAnst. Wein- Obst- u. Gartenb., 4471
  - Georgia Exp. Stats, 4494e
  - Gold Coast Dep. Agric., 2103
  - Gulval exp. Stat., 2104
  - Hawaiian Sugar Planters' Ass. Exp. Stat. Cttee, 2035
  - Hong Kong Dir. Agric., 2119d
  - hort. Education Ass., 2105, 2119e
  - Indian—
    - agric. Res. Inst., 3300
    - Coffee Bd, 3152
    - Tea Ass. sci. Dep., Tocklai, 2068
  - Inst.—
    - Brewing, 2895
    - Encouragement Rech. sci. Ind. Agric. (I.R.S.I.A.), Brussels, 4473
    - nat. Étude agron. Congo belge (I.N.E.A.C.), 834, 835
    - nat. Rech. agron., Paris, 1061i, 3301
    - Rech. Caoutch. Indochine (I.R.C.I.), 949
    - Rech. Huiles Oléag. (I.R.H.O.), Paris, 927
  - Jamaica Dep. Agric., 836
  - John Innes hort. Instn, 1041, 3302
  - Jordan agric. Res. Serv., 4478
  - Kenya—*see also above*, Coffee—Dep. Agric., 2119f, 3303
  - Kesteren St. hort. adv. Serv., Holland, 3304
  - "Lange Ossekampen" centr. manurial Trial Ground, 2119g
  - Lausanne—*see below*, Stations
  - Long Ashton agric. hort. Res. Stat., 1046
  - Luddington exp. hort. Stat., 2107
  - Macaulay Inst. Soil Res., 3305
  - Madagascar, Rech. agron. C.R., 4273
  - Madras Dep. Agric., Work of agric. Stats, 2108
  - Malaya Dep. Agric., 1915
  - Mauritius—
    - Dep. Agric., 3307
    - Sugar Ind. Res. Inst., 4362
    - Sugarcane Res. Stat., 3199
  - Michigan agric. Exp. Stat., 1061j, 4494f
  - Mississippi agric. Exp. Stat., 3308
  - Missouri agric. Exp. Stat., 3309
  - Molo hort. Stat.—*see above under* Kenya
  - Mushroom Res. Stat., Yaxley, Peterborough, 3872
  - Naaldwijk Res. Stat. Fruit Veg. Cult. under Glass, 4480
  - Natal agric. Res. Inst., 3316
  - New South Wales Dep. Agric., 4482
  - New York St. agric. Exp. Stat., 4483
  - New Zealand Dep. Agric., Hort. Div., 1047
  - New Zealand D.S.I.R., 2099

Annual Reports (*continued*)—
  Nigeria agric. Dep., 4269
  Northern Rhodesia Dep. Agric., 4494h
  Nyasaland Dep. Agric., 3251, 3310, 3323 l
  Opheusden Tree and Fruit Inst., Holland, 3304
  Palmira agric. exp. Stat., 3311
  Pennsylvania agric. Exp. Stat., 3323m
  Purdue Univ. agric. Exp. Stat., Lafayette, 4485
  Queensland Bureau Sugar Exp. Stats, 2037
  Queensland Dep. Agric. Stock, 2109
  Rothamsted exp. Stat., 4494i
  Royal Inst. for the Tropics, Amsterdam, 1061o
  Rubber Res. Bd, Ceylon, 948
  Rubber Res. Inst., Malaya, 961, 2021
  Rumbeke-Beitem exp. Gdn, 2110
  San Remo floric. Res. Stat., 1745
  Santa Barbara bot. Gdn, 2119h
  Sarawak Dep. Agric., 2119i
  Seychelles Dep. Agric., 1061p
  Sierra Leone Dep. Agric., 1061q, 4494j
  South Africa(n)—*see also above*, Natal, *and below*, Stellenbosch—
    Div. Ent., 3315
    Div. Hort., 2622
    Sugar Ass. Exp. Stat., 2038
  Stations féd. d'Essais agric. Mont-Calme et de Montagibert, Lausanne et Pully, 1044
  Stellenbosch-Elsenburg Coll. Agric., 3314
  Storrs agric. Exp. Stat., Connecticut, 1061e, 2097
  Sudan Minist. Agric., 2119j, 3312
  Tanganyika Govt Chem., 4447t
  Tea—*see above*, Ceylon *and* Indian, *and below*, United Planters
  Tobacco Statistics, 548
  Trinidad, Imp. Coll. trop. Agric., 838, 3323i
  Trinidad and Tobago, Dir. Agric., 839, 3313
  Tropical Prod. Dep., Amsterdam, 1050
  Tunisie Serv. bot. agron., 4487, 4494m
  United Planters' Ass. S. India, Tea sci. Sect., 999
  United States—
    Administ. agric. Res., 1054
    agric. Exp. Stats, 4489
    agric. Statistics, 4488
    Bureau—
      agric. industr. Chem., 1055
      Ent. Plant Quarantine, 1056
      Plant Ind., Soils, agric. Engng, 1057, 4490
  Vegetable Res. Stat., Wellesbourne, nat., 3956m
  Wageningen Inst. Breeding hort. Crops, 4472
  Wageningen Inst. hort. Tech., 1058
  Wattle Res. Inst., Pietermaritzburg, 2119m
  Wellesbourne—*see above*, Vegetable
  West African Cacao Res. Inst., Tafo, 854-856
  West African Inst. Oil Palm Res., 3174
  West of Scotland agric. Coll., 3317
  Wisconsin agric. Exp. Stat., 1059, 1061r, 2113

Annual Reports (*continued*)—
  Wye College, Kent, Dep. Hop Res., 4039
  Zanzibar Dep. Agric., 883
*Anoplolepis* spp., harmful ants, 3147
Ant(s), beneficial, 3141, 3147, 4320
Ant(s), harmful, and their control, 315, 843, 1815, 1918, 1957, 1996, 1997, 2103 2654, 3147, 4228
*Anthocephalus cadamba*, 2881
Anthocyanin—*see under* Pigments
*Anthonomus cinctus*, 318
*Anthonomus pomorum*, 1434, 2496
*Anthriscus sylvestris*, 376
Antibiotics—
  from actinomycetes, 3985
  from bacteria, 3054
  as bactericides, 280, 298, 372v, 470, 1333, 1513, 2441-2446, 2545c, 2696, 2697, 3664, 3665, 3783, 3932, 3937, 4490
  chlorine inactivates, 2698
  from fungi, 372v, 3666, 3944, 4081
  as fungicides, 280, 300, 302, 1059, 1514, 2545c, 2701, 3054, 3236, 3819, 3944, 4081, 4108, 4406, 4483
  growth substances enhance action of, 2441
  in or from plants, 1413, 1742 l, 2698
  plant growth affected by, 357, 1412, 3784, 3937
  plant uptake and translocation of, 1555, 3783, 4490
  reviews, 2545c, 2545u
  as storage dips, 3819
*Antidesma dallachyanum*, 4264x
*Antidesma* spp., wine from, 4446z
*Antirrhinum*—*see* Snapdragon
*Antispila rivillei*, 1390
*Antonina* spp. as lawn pests, 687, 1784
*Anuraphis devecta*, 3635
*Anuraphis tulipae*, 1523
Aomori Apple Exp. Stat., Japan, A.R., 3539c
*Aonidiella aurantii*—*see* Citrus pests, scale, red
Aonla—*see Phyllanthus* spp.
*Apanteles sesamiae*, 3237
*Aphelenchoides*—
  *cocophilus*, 896, 897
  *fragariae*, 648, 1370
  *ritzema-bosi*, 372i, 648, 662, 1370
Aphid(s)—*see also under scientific names and host plants*—
  control by sprays and dusts, 1434, 1581, 1582, 1868, 2110, 2546j, 2703, 2704, 3635, 3637, 3638
  control by systemic insecticides, 1056, 1521, 2492, 2494, 2512, 2518, 2546j, 3677, 3812, 4045, 4152
  European species, 1435b
  fecundity, host nutrition affects, 3850
  identification, 3689e
  as virus vectors, 1056, 1377, 1858, 2112, 2434, 2835, 2854, 3600, 3810-3812, 3849, 3936, 3950, 4083, 4113, 4223, 4281, 4410

- *Aphis*—
  - *citricidus*, 1858
  - *fabae*, 2703
  - *gossypii*, 3950, 4113, 4223, 4281
  - *maidis*, 4281, 4410
  - *pomi*, 2492, 2518, 3677
  - *rumicis*, 4487
  - *spiraecola*, 4223
- *Apion longirostre*, 4095
- Apocynaceae, glycosides from, 2922b
- *Apogonia* spp. on cacao, 880
- Apparatus and instruments—*see also* Machines, Spray *and* Tools—
  - for controlling humidity in chambers, etc., 1137
  - for determining essential oils in plants, 4016
  - for determining ethylene, 2141
  - for determining oil deposits on plants, 3100o
  - distillation, 2879
  - for fumigating soil—*see* Fumigation, soil
  - for injecting nutrients, 867
  - irrigation—*see* Irrigation equipment
  - for measuring—
    - colour, 542i
    - daylight, 1144
    - dew, 2191, 2193
    - fruit size, 2285
    - firmness in fruits and vegetables (penetrometer, tenderometer, etc.), 468, 4475
    - sex expression in castor bean flowers, 4059
    - soil moisture, 3222, 3918
    - spray nozzle performance, 2201
    - spray particles, 2536-2538
    - water deposits on plants, 2192
  - rain-gauges, 3434
  - for recording temperatures inside plants, 2779
  - for removing aseptic cylinders of tissue, 1143
  - soil sterilizing, portable, 1517
  - soilless culture—*see* Soilless
- Apple—*see also* Cider *and Malus*—
  - anatomy, bud, 3487, 3488
  - anatomy, leaf, factors affecting, 2228
  - biennial bearing—*see below*, fruiting
  - blossom(ing)—
    - abnormal, 2261
    - nectar secretion, 3414
    - structure, 2259
    - thinning by sprays—*see also below*, fruit—173, 177, 1059, 2110, 2286, 2287, 2289, 2292, 3495, 3496
  - breeding—
    - colchicine treatment, 2228
    - general, 90, 201s, 1156, 2232, 2233, 2261, 2545f, 2545p, 3539x, 4485
    - polyploids, 136, 2228, 2229
    - of rootstocks, 2322n, 2422
    - X-ray treatment, 3452, 3453
  - bud anatomy, 3487, 3488
  - bud auxin content, 2225
  - chimaeras—*see below*, mutations
  - climate—
    - drought injury, 3577
    - flooding—*see below*, soil waterlogging
    - growth affected by, 3485
- Apple—climate (*continued*)—
    - hail damage, 2427
    - solar radiation, fruit quality affected by, 2223
    - spring frost injury, 2419
    - spring frost protection, 1315, 2421, 2423
    - sun burn, 3670
    - temperature responses of fruit, 201m
    - winter hardiness—*see also below*, rootstocks, hardy, *and* stem builders—90, 91, 113, 1184, 1185, 1187, 1188, 2230, 2231, 2300, 2420
    - winter injury, 2415, 2420, 2545i, 3470, 3485
  - composition—*see also below*, nutrition—
    - fruit—
      - acids, 2304, 2307, 2322h, 3527, 3536
      - carbohydrates, 1211, 2223, 2307
      - general, 137, 1234, 2305
      - mineral, 2271
      - nitrogen compounds, 1212, 2308, 3520, 3528
      - sprays affect, 3669
      - tannin, 201v
      - vitamins, 1213, 1214, 1220, 2301
    - leaf, 39, 144-146, 156, 1209, 1210, 1325, 2250, 2251, 2265-2267, 2270, 2271, 3514, 3778
    - seed, 189
    - shoots and branches, 1207, 2267-2269, 2271, 3507
  - diseases and disorders—*see also below*, nutrition *and* storage—
    - bacterial, fire blight (*Erwinia amylovora*), 280, 1333, 2441, 2444, 2446, 3689p
    - cause uncertain, bark necrosis (*Didymella* sp.?), 260
    - cause uncertain, decline, 2402
    - fungus—
      - bitter rot (*Glomerella cingulata*), 3674
      - black pox (*Helminthosporium papulosum*), 359
      - black rot (*Physalospora obtusa*), 280
      - brown rot (*Sclerotinia* spp.), 293, 1347, 1435 l, 3613
      - canker (*Nectria galligena*), 372u, 1336
      - flyspeck (*Leptothyrium pomi*), 359, 1435f
      - fruit rot (*Botryosphaeria ribis*), 283, 359
      - lenticel rot (*Gloeosporium* spp.), 3605
      - mildew (*Podosphaera leucotricha*), 288, 291, 1338, 1339, 3690c
      - *Phoma* sp., 373a
      - phytophthora, collar or crown rot (*Phytophthora cactorum*), 246, 284, 1343-1345, 3606
      - *Phytophthora* sp. in roots, 3581
      - rust (*Gymnosporangium juniperi-virginianae*), 289
      - scab (*Venturia inaequalis*)—
        - biology, 1340, 3609, 3690j
        - control, general, 246, 287, 289-291, 372s, 1339, 1341, 1342, 1435h, 2110, 2113, 2451-2457, 2545e, 2545z, 3607, 3608, 3610, 3630, 3670, 3671, 3674

- Apple—diseases and disorders—fungus—scab (*continued*)—
        - control by ground treatment, 1342
        - control by low volume spraying, 292, 2450, 2535
        - on ornamental *Malus* spp., 721
        - resistance, 201s, 285, 2232, 2233, 2449, 2545f, 2545p, 3539x
        - warnings and spore discharge, 1340, 2545s
      - silver leaf (*Stereum purpureum*), 373c
      - sooty blotch (*Gloeodes pomigena*), 359
      - *Sphaeropsis pseudodiplodia*, 1337
    - in New Zealand, 1300
    - non-parasitic—*see also above*, climate, *and below*, nutrition—
      - bitter-pit, 2312, 3585
      - calyx-end breakdown, 3584
      - fruit cracking, 1309
    - virus—
      - ring-spot, 3590
      - rosette, 1326
      - rubbery wood, 1327, 3589
      - in Yugoslavia, 2546 l
  - economics, marketing, 201g
  - economics, production, 2218
  - frost effects—*see above*, climate
  - fruit(ing)—*see also above*, composition, *and below*, harvesting, packing *and* storage—
    - biennial, 169, 2288, 2291, 2292, 3514
    - cell—
      - development, 2260
      - size, fruit size related to, 135
      - size, keeping quality related to, 1217, 3445
    - colour, factors affecting, 196, 2277
    - colour, sprays to improve, 182, 183, 1200, 2110
    - cracking, 1309
    - development, temperature affects, 201m
    - drop, spraying or dusting to retard, 179-181, 1199, 3501, 4490
    - enzyme activity, 2307
    - ethylene production by, 3518
    - malformations, 259, 1435a, 2263
    - maturity—
      - criteria of, 195
      - days from blossoming to, 2306
      - growth substances affect, 1200, 2284
      - physiology of, 2307, 2312
      - rootstocks affect, 3445
      - tests, 137, 1234, 2306, 2309
    - pear-like, 1236r
    - quality, factors affecting, 196, 1234, 2451, 3669
    - respiration—*see also below*, storage—135, 138, 2308, 2309, 2311, 3518, 3519, 3520
    - russeting, sprays cause—*see also below*, spray injury—359, 360, 2516, 2545a
    - size—
      - cell size affects, 135
      - change of environment affects, 90

- Apple—fruit(ing)—size (*continued*)—
      - nutrition affects, 196
      - pollen parent affects, 2257
      - predicting ultimate, 2285
    - thinning—*see also above*, blossom—174, 175, 177, 178, 2106, 2110, 2284, 2285, 2289-2292, 2296, 3498, 4489
    - variation, within tree, 1218
    - yields, 1160, 1163
  - growing—*see also below*, research *and* varieties—in—
    - Australia, 1149, 3539e
    - Belgium, 3539g
    - France, 3446, 3447
    - Germany, 1236j
    - Italy, 201f
    - the U.S.S.R., 2221
  - growth—
    - buds, adventitious, 3487
    - herbicides affect, 1480, 3740
    - measurement, 3486
    - phases, juvenile and mature, 134, 1090, 1175
    - re-invigoration by inarching, 3467
    - rings, 3485
    - root, factors affecting, 1169, 3467
    - sucker, 3487
    - tree height, winter hardiness affected by, 1188
  - harvesting methods, 192, 193, 196
  - history, 2210
  - hybrids, vegetative, 91
  - insect fauna on, 349
  - intermediate stocks—*see below*, stem builders
  - leaf anatomy, 2228
  - leaf chlorophyll, sprays affect, 2517
  - manuring—*see below*, nutrition
  - marketing, 201g, 1232, 1233
  - mulching—*see below*, soil management
  - mutations, 136, 1154, 3452, 3453, 3478
  - mycorrhiza, 3355
  - nutrition—*see also above*, composition—
    - boron, 253
    - calcium, 2268
    - copper, 254, 2400
    - iron, 1302, 2400, 2406
    - magnesium, 1210, 1435c, 2250, 2266, 2268, 2271, 2407, 3301
    - manganese, 2400
    - manuring, 142, 144, 2119g, 2269, 3304, 3506, 3577
    - nitrogen, general, 196, 2265, 2267, 2268, 3507, 4489
    - nitrogen sprays, urea, 148, 2276, 2277, 3502
    - phosphorus, 2265, 2266, 2268
    - potassium, 149, 1209, 2250, 2265-2268, 2271, 2400
    - reviews, 1052, 4453
    - rootstock affects, 2250, 2251
    - salt tolerance, 2412
    - storage quality affected by, 196, 3527, 3528

- Apple—nutrition (*continued*)—
  - tracheal sap extracted for the study of, 1207
  - zinc, 2400
- packing—
  - consumer reactions to, 1232
  - containers, 192, 1227, 1231, 2313, 2322j
  - grading, 77, 201q, 3532
- pests—
  - *Ametastegia glabrata*, 341, 1397
  - aphid—
    - green (*Aphis pomi*), 2492, 2518, 3677
    - grey or gall (*Anuraphis devecta*), 3635
    - in Britain, 3689e, 3689z
  - blossom weevil (*Anthonomus pomorum*), 1434, 2496
  - codling moth (*Cydia pomonella*)—*see also* Codling moth—329, 330, 1391, 1392, 1424, 2504-2506
  - *Colaspis quattuordecimcostata*, 3639
  - control, biological, 2520
  - control, general, 1300, 1421, 1432, 1434, 2545z, 3631, 3670
  - curculios (*Conotrachelus nenuphar* and *Tachypterellus quadrigibbus*), 316, 372k
  - ermine moth (*Hyponomeuta padella malinella*), 3667
  - eye-spotted bud moth (*Spilonota ocellana*), 1424
  - fruit flies (*Anastrepha*, *Ceratitis* and *Dacus* spp.)—*see also below*, maggot—1386, 1387
  - leaf—
    - curling midge (*Dasyneura mali*), 3645
    - hopper, 325
    - miner (*Lithocolletis crataegella*), 372g, 1389
  - maggot (*Rhagoletis pomonella*), 1388
  - red bud borer (*Thomasiniana oculiperda*), 3644
  - mites, red spider (*Metatetranychus* and other spp.), 246, 1374, 1424, 1429, 2485, 2488, 2489, 2492, 3626-3628, 3632, 3670, 3677, 3689v, 3690m
  - nematodes, 1368, 3445, 3581
  - *Pentodon* sp., 321
  - rabbits and hares, 1406
  - sawfly (*Hoplocampa testudinea*), 338, 339, 1435k, 3655, 3656
  - scale—
    - Forbes (*Aspidiotus forbesi*), 344, 3657
    - oystershell (*Lepidosaphes ulmi*), 349, 1424, 3657
    - *Quadraspidiotus schneideri*, 2495
    - scurfy (*Chionaspis furfura*), 3657
  - shot hole borer (*Xyleborus dispar*), 322
  - tortrix moths (*Adoxophyes orana*), 2545l
  - in the U.S.A., 3631
  - woolly aphid (*Eriosoma lanigerum*), 2518, 3632, 3690b
- physiology—*see also above*, fruit *and* growth, *and below*, storage—
  - nitrogen metabolism, 2276, 2277
  - photosynthesis, 2251
  - transpiration, 1187

- Apple (*continued*)—
  - planting—
    - in old apple soils, 1308, 3582
    - root pruning for, 1178
    - spacing, 165
  - pollination—
    - artificial, 1193
    - blossom structure and, 2259
    - of cider varieties, 130
    - fruit and seed characters affected by male parent, 2257
    - general, 129
    - with pear pollen, 92
    - pollen source affects rate of seed germination, 1194
    - pollen viability and germination, 130, 132
  - production and trade, 3326
  - products and by-products, 2322i
  - propagation—*see also below*, rootstocks *and* seed—
    - budwood position affects hardiness, 1185
    - cuttings, stem, 1236n, 3462
    - frameworking, 2246
    - grafting and budding, 110, 1175, 3466
    - inarching, 3467
    - layering, 3465
    - marcotting, 1174
  - pruning and training—
    - Bouché-Thomas method, 2083
    - cordons, espaliers and hedges, 2300, 3473
    - general, 2299
    - Lepage method, 167
    - Renaud method, 2298
    - methods compared, 165, 166, 3503
    - regulated method, 3504
    - spiral method, 167
  - research in Japan, 3539c
  - research in New Zealand, 1038
  - root growth, 1169, 3467
  - root mycorrhiza, 3355
  - rootstocks—*see also below*, stem-builders—
    - "A" series, 118, 3470
    - anchorage, 2248
    - Anis, 115
    - apomictic, 121
    - in Australia, 3469
    - Beautiful Arcade, 115
    - in Belgium, 2110
    - in Canada, 2247
    - Clark Dwarf, 120
    - crab, 156, 2245
    - Double Vigour (French crab), 116
    - in Finland, 1170
    - fruit maturity affected by, 3445
    - fruit storage quality affected by, 3529
    - in Germany, 1179, 1236f, 3479
    - hardy—*see also above*, climate—113, 1170, 1179, 2422
    - for inarching, 3467
    - Malling, 114, 115, 118, 120, 156, 3470, 3472, 3473, 3476, 3477, 3589, 4485
    - Malling-Merton (M.M.), 119, 1236o
    - *Malus*—
      - *prunifolia*, 3474

- Apple—rootstocks—*Malus* (*continued*)—
      - *sargenti* × *M. astracanica*, 2244
      - *sikkimensis*, 2244
    - Merton, 117
    - Northern Spy, 116, 3472
    - own roots compared with, 3472
    - pear, 1155
    - planting methods, 1178
    - -scion relationships, 113, 1175, 2244, 2249-2251, 3475
    - seedling, raising of, 107, 1171, 3460
    - in South Africa, 117
    - in Sweden, 118, 2322n, 3470
    - in the U.S.S.R., 3474
  - seed—
    - after-ripening, 3459
    - embryology, 2296
    - germination, 1194, 2257, 3459
    - hormones, 189, 2296
    - rootstock propagation from, 107, 1171, 3460
    - storage, 2322p
  - soil(s)—
    - analysis, leaf analysis correlations with, 146
    - management—
      - cover crops and grass, 156, 158, 341, 1204, 3510
      - mulching, 154, 1057, 1202
      - ploughing, 2283
      - a review, 1052
      - weed control, 2591
    - requirements, 155, 2282
    - sickness, 1307, 1308, 3581, 3582
    - water responses, 154
    - waterlogging and flooding, 267, 1323
  - spray(s) (ing)—
    - concentrate, 3690r
    - fruit composition affected by, 3669
    - injury, 360, 363, 2516, 2517, 2545a
    - mixtures, general-purposes, 3670
    - programmes and calendars, 1299, 2545y, 2545z, 2546b, 3631, 3690d
    - residues on foliage, 2527
    - residues on fruit, 370, 2543, 3684, 3685
  - stem-builders and other intermediates, 122, 1179, 1181, 2244, 2246, 2248, 2249, 3480, 3529
  - storage—
    - carbon dioxide fixation during, 3523
    - cold, 2315, 2320, 3517, 3524-3526
    - delays before, cause loss, 194
    - dips and coatings, 197, 198, 1225, 1226
    - diseases, rots, 308, 1221, 3605
    - disorders, physiological—*see also above*, diseases, non-parasitic—198, 199, 1218, 1225, 1226, 1229, 1230, 2223, 2312, 3445
    - economics, 201g
    - enzymic browning, 1216, 2307
    - gas, 135, 196, 3304, 3445, 3522, 3523
    - metabolic changes during, 3524
    - moss, 2322f
    - plastic box liners for, 1227
- Apple—storage (*continued*)—
    - quality, factors affecting, 1217, 1218, 2223, 2312, 3445, 3500, 3525, 3527-3529
    - respiration during, 197, 3445
    - shrivelling, 2260
    - varietal behaviour, 135, 201t, 1219-1221, 2318, 3522, 3539r
    - volatile substances produced during, 200, 3524
    - weight loss in, 3526
    - wraps, 1226, 3530
  - thinning—*see above*, blossom *and* fruit
  - training—*see above*, pruning
  - varieties—*see also above*, growing *and* storage—
    - Alfa 68, 2227
    - Calville, 201t
    - in Canada, 1048, 1184
    - cider, 96, 3536
    - Clark Dwarf, 120
    - Cox's Orange Pippin, 118
    - Delicious, 3455
    - disease resistance, 2232, 2233, 4485
    - in France, 1162
    - Gravenstein, 118, 2320
    - in Great Britain, 95
    - in Holland, 1163
    - Holstein Cox, 3456
    - in Italy, 2220
    - James Grieve, 118
    - in Japan, 3454
    - in North Africa, 201p, 3473
    - ornamental, 1049
    - Reinette d'Armorique, 98
    - in South Africa, 1161
    - Stayman Winesap, 2318
    - Sturmer Pippin, 194, 3584
    - in Switzerland, 201q
    - in the U.S.A., 1159, 1160, 3458
  - weeds—*see above*, soil management
  - wild, 2322d
  - yields—*see above*, fruit
- Apricot—
  - black—*see Prunus dasycarpa*
  - blossom bud initiation and development, 140, 162
  - blossoming, growth substances retard, 1198
  - breeding, 2238, 4487
  - climate—
    - autumn frost, protecting fruit against, 2295
    - temperature responses of fruit, 2222
    - winter chilling requirements, 140
    - winter hardiness and injury, 3481, 3580
  - diseases—
    - cause unknown, allophylly, 1310
    - fungus, 295, 296, 1311, 1347, 3614, 3617, 3618
    - non-parasitic, 3580, 4482
    - virus, 2546 l, 3593, 3594
  - fruit—
    - growth substances affect, 185, 2295
    - temperatures affect, 2222
    - thinning by sprays, 178
  - growing in North Africa, 88

- Apricot (*continued*)—
  - growing in the U.S.S.R., 3450
  - nutrition, a review, 4453
  - nutrition, salt injury and tolerance, 153, 2412
  - pests, insect, 327, 1435j, 2500, 3649
  - ×plum hybrids, 2237
  - pollination, 129
  - processing, canning, 4487
  - processing, drying, 1235, 3535
  - products and by-products, 1235, 3539k
  - pruning and training, 2322b
  - root system, 781
  - rootstocks, 2238, 3469, 3481-3483, 3580
  - seed, poisonous properties, 3516
  - seed storage, 2322p
  - soil management—
    - dry culture, 88
    - irrigation, 162, 164
    - mulching, 2281
  - varieties, 201p, 3458
- *Arabidopsis thaliana*, 2165
- *Arabis alpina*, 4077
- *Arabis hirsuta*, 2165
- *Aralia californica*, 2984
- *Araneta Journal of Agriculture*, a new periodical, 2114
- *L'Arboriculture fruitière*, a new periodical, 3319
- *Archangelica officinalis*, 4020
- *Archips argyrospila*, 799
- *Archiv für Gartenbau*, a new periodical, 2117
- *Archives of Rubber Cultivation*, a new periodical, 3318
- Arctic flora, cryptogamic, 3348
- *Argemone mexicana*, 3719
- Argentina—
  - agriculture and research, 1
  - capparidaceous plants of, 4068k
  - castor bean growing, 2905
  - conifer growing, 735y
  - hop growing, 1727
  - mint growing, 2922e
  - opium poppy growing, 590, 1714
  - ornamental plants, 1813b
  - pear growing, 2234
  - vegetable growing, 1559, 1561, 1647o, 1647y
  - vine growing, 244e, 1268
- *Argyresthia ephippella*, 1394
- *Argyria sticticraspis*, 4476—*see Chilotraea infuscatellus*
- *Argyrotaenia citrana*, 799, 3649
- Arizona agric. Exp. Stat., A.R., 3323a
- *Aronia arbutifolia*, 4141
- *Artemisia*—
  - *caerulescens*, 2882
  - *dracunculus*, 2883
  - *maritima*, 584, 615e
  - *tridentata*, 3737, 3738
  - *vulgaris*, 404a
- Artichoke—
  - globe—
    - growing in Italy, 2656
    - growing in New Zealand, 406
    - pests, 3789-3791
- Artichoke (*continued*)—
  - Jerusalem, composition, 1113
- *Artocarpus heterophyllus*(*a*), 4444
- *Asclepias* spp., rubber plants, 2902
- *Ascochyta pinodella*, 2700
- *Ascochyta pisi*, 1510, 1577, 1578, 2698, 2700
- Ascorbic acid—*see* Vitamin C *and individual plants under* composition
- Aseptic culture of higher plants, 38, 109, 3461
- Asia, Far East, agriculture, 1075
- Asia, Near East, agriculture, 1074
- Asparagus—
  - breeding, 1524, 3764, 4472
  - diseases, fungus, *Fusarium culmorum*, 3795
  - diseases, fungus, rust (*Puccinia asparagi*), 429, 3796, 3797
  - forcing, 2657
  - growing in various countries, 428, 1525, 3792-3794
  - harvesting, 3794
  - planting, spacing, 1533
  - research in Switzerland, 1044
  - roots, velamen cells in, 658
  - soil management, weed control, 1481, 2558, 2604-2606, 3706, 3716, 3753, 3793, 3794
  - storage, 2635
  - tissue culture, 542q
- *Aspergillus*—
  - *niger*, antibiotic from, 372v
  - *niger*, soil nutrient status determined by, 3390
  - spp. attacking cacao beans, 4307
- *Asphodelus tenuifolius*, 3719
- *Asphondylia capsici*, 540
- *Aspidiotus forbesi*, 344, 3657, 3683
- *Aspidiotus perniciosus*—*see* San José scale
- Aster diseases, 735 l, 1752, 2932
- *Asystasia bella*, 735x
- Atmospheric pollution—*see* Air
- Atomic radiation injury to plants, 2994
- *Atriplex* spp. for salt removal from soils, 51
- *Atropa belladonna*, 582, 1708-1710, 2922f, 4008, 4009
- Auchincruive—*see* West of Scotland agric. Coll.
- Australia(n)—*see also individual States for reports*—
  - apple growing, 1149, 3539e
  - asparagus growing, 3792
  - banana growing and research, 1920
  - Canned Fruit Bd, A.R., 2119a
  - citrus growing, 3017
  - C.S.I.R.O., A.R., 1039, 4467
  - Dried Fruit Control Bd, A.R., 1295b
  - flora, standardized nomenclature, 1455
  - fruit growing, research and varieties, 1072, 2214, 2215, 3469, 3535
  - ginger growing, 4004
  - papaw growing and research, 2008
  - pineapple growing and research, 942
  - safflower growing, 4063, 4064
  - sugarcane—
    - growing, 2078u, 3285
    - research, 2037
    - varieties, 3201, 3202

Australia(n) (*continued*)—
- Tatura Res. Stat., Victoria, 81
- tobacco growing, 551
- weed control, 3693

Austria—
- strawberry growing, 3572q
- tobacco growing, 1654, 1697b
- vegetable growing and varieties, 1488, 2626

*Austrogallia torrida*, 3785

*Avena* tests, improved holder for, 79r

*Averrhoa carambola*, 4441, 4442

Avocado—
- anatomy, 746
- climate, frost protection, 747
- climate, winter hardiness, 3100v
- composition—
  - fruit, 4177, 4178
  - leaf, 742, 744
  - tree, 742
- diseases—
  - fungus—
    - canker (*Botryosphaeria ribis* (*Dothiorella* sp.)), 1817, 4173
    - root rot (*Phytophthora cinnamomi*), 750, 751, 832x, 832y, 4174
    - wilt (*Verticillium albo-atrum*), 4175
  - non-parasitic, chlorosis, lime-induced, 743, 744
  - virus, sun blotch, 748, 749, 1816
- flower behaviour, 737
- fruit—
  - abnormalities, 4172
  - anatomy, 746
  - ethylene production by, 3518
  - fumigation, 844
  - respiration, 832o, 3518
  - water transfer to leaves from, 4177
- growing in—
  - Brazil, 832v
  - Hawaii, 4264o
  - India, 3100b
- growth, growth substances stimulate, 3014, 4170
- nutrition—
  - biuret injury, 4167
  - calcium, 777, 4168
  - iron, 744, 4274
  - manuring, 740, 4166
  - minor elements, 741
  - molybdenum, 777
  - nitrogen, 4167
  - potassium, 3015
  - a review, 4453
  - sodium and/or chloride injury, 743, 745, 3015, 4177
  - sulphur, 4169
  - zinc, 740
- packing, 1819
- pests—
  - control, biological, 4264k, 4264l
  - *Colaspis quattuordecimcostata*, 3639
  - *Euglyphis fibra*, 1818
  - Fuller rose beetle (*Pantomorus godmani*), 4176

Avocado—pests (*continued*)—
  - mites, 365, 752
  - nematodes, 3016
  - in the U.S.A., 832f
- pollination, 4171
- propagation by budding and grafting, 739, 3013, 3316, 4165, 4170
- propagation by cuttings, 736, 738, 3014
- research in Florida, 2101
- rootstocks, clonal, 4165
- rootstocks, seedling, 743, 745, 832g, 4164
- soil management, irrigation, 4166
- storage, cold, 1819, 3018
- storage, fumigation, 844
- varieties, 10, 832w, 1159, 2098, 3012, 3100v, 3100w, 4267

*Axonopus affinis*, 1780

Azalea—*see also* Rhododendron—
- diseases, 3308, 4159
- flower forcing, 4144
- *Handbook*, 1026
- nutrition, 728, 729, 734, 2989, 4074
- pests, 710
- photoperiodic response, 728
- propagation by cuttings, 728, 729, 1796
- research in Belgium, 618
- temperature response, 728

*Azochis gripusalis*, 3654

*Azotobacter*, herbicides do not affect, 1477

*Azteca paraensis*, 1957

*Bacillus*—
- *cereus*, 3667
- *nelumbii*, 2977
- *subtilis*, 3054

Bacterial fertilizers, 1123

Bactericides—*see also under individual crops and organisms*—
- antibiotics as—*see* Antibiotics
- dithiocarbamates, 280
- seed treatment with—*see* Seed

*Bacterium*—
- *carotovorum*, 1813c
- *subtilis*, 3938
- *tumefaciens*—*see* Crown gall

*Bagrada cruciferarum*, 2838s

Bahamas, fruit growing, 4267

*Balanites aegyptiaca*, 2904

Balsgård Fruit Breed. Stat., work at, 2226

Banana—*see also Musa*—
- a book on, 1025
- breeding and selection, 845
- diseases—
  - bacterial, moko (*Pseudomonas solanacearum*) 1512
  - cause uncertain, rayadilla, 3311
  - cause uncertain, rhizome rot, 3117
  - fungus—
    - cercospora leaf spot, 1924, 1925
    - corm rot (several organisms), 1926
    - false mosaic (*Hormodendron* sp.), 4280
    - panama disease (*Fusarium oxysporum* f. *cubense*), 850, 851, 852, 1017q, 1017r, 4282

- Banana—diseases (*continued*)—
    - non-parasitic, 849
    - virus, mosaic, 4281
  - flower—
    - abnormalities, 3269k
    - development, 846
    - ovary, growth substances in, 4279
  - fruit—
    - abnormalities, 3113
    - ethylene production by, 3518
    - fumigation, 844
    - maturation, intercellular spaces change during, 3114
    - maturity estimation, 3115
    - maturity, growth substances hasten, 1930
    - measurements, 847
    - respiration, 3115, 3518
    - stems, anti-frost covers for, 1930
    - stems, removal of dead flower parts from, 1929
  - growing in—
    - Angola, 3299
    - Australia, 1920
    - British Guiana, 4268
    - the Cameroons, 2119b
    - Egypt, 2078k
    - India, 1025
    - South Africa, 2078z
  - mutations, 3269t
  - nutrition—
    - iron, 1923
    - magnesium, 849
    - manuring, 1922, 4278, 4494c
  - packing, 3115
  - pests, borer (*Cosmopolites sordidus*), 1927, 1928, 3270m
  - pests, weevil (*Metamasius hemipterus*), 1927
  - products, canned, 4284
  - products, dried "figs" and flour, 2078q
  - research in—
    - Australia, 2109, 4482
    - the Belgian Congo, 834
    - India, 2108
    - Trinidad, 3109
  - seed production by parthenocarpic, 1921
  - soil management—
    - cover crops, 848
    - irrigation, 3116
    - mulching, 848, 4277
  - storage—*see also above*, products, *and below*, transport—
    - chilling affects, 3586
    - cool, 4283
    - dips, 1930
    - ripening, artificial, 1931
  - transport, 3115
  - varieties and species, 1025, 2079h, 3110-3112, 3270n, 4277
- Barbados—*see also* British West Indies—
  - Dep. Sci. Agric., A.R., 4461
  - sugarcane breeding, 4366
- Basil—*see under* Camphor basil
- *Bassia longifolia* flower composition, 3269b
- *Bassia longifolia* as a rootstock for sapodilla, 4445
- Basutoland Dep. Agric., A.R., 3323b
- Batum botanic garden, 2125
- Beans—*see* Beans (*Phaseolus*), Beans (*Vicia*), Cover crops, *and individual species*
- Beans (*Phaseolus*)—
  - air pollution affects, 1085
  - anatomy, 3353, 3354
  - breeding and selection, 2702, 2839d, 3857, 3955a, 3955b
  - climate—*see also below*, physiology—
    - drought responses, 3860
    - evapotranspiration, 415
    - flowering and pod set affected by, 3855
    - heat injury and resistance, 2680
    - rain, excretion of leaf minerals by, 2181
    - soil temperature responses, 467
  - composition, plant, 39, 1505, 1579, 2146, 2693, 2694
  - composition, seed, 3869
  - diseases—
    - bacterial, 470, 1513, 2696, 2697, 3783, 3857, 3867, 4490
    - fungus, 459, 471, 500, 1579, 1580, 3865, 3868, 3870, 3956k, 4489
    - non-parasitic, 2147, 3861
    - varietal resistance, 1509
    - virus, 469, 2855, 3863-3866
  - flower differentiation, 463
  - growing—
    - under glass, 500
    - labour requirements, 1489
    - in various countries, 458, 1492, 3859, 3955k
  - growth—
    - antibiotics affect, 1412
    - injury to seed affects, 2683
    - growth substance responses, 543 l, 1145i, 1145j, 2153, 2691, 2695, 3385, 3858, 4490
    - substances in, 79i
  - leaf development, 3353, 3354
  - nutrition—
    - boron, 3862
    - carbon dioxide, 3426
    - carbonates, 2147
    - chloride, 1501, 2146
    - copper, 41, 466
    - foliar, 2176, 2636
    - iron, 1117, 2147
    - manuring, 1501, 2692, 3777
    - molybdenum, 466
    - nitrogen, 2640, 2687, 3402
    - phosphorus, 467, 1573, 2181, 2693
    - yttrium, 3407
    - zinc, 466, 2693, 2694
  - pests—
    - aphids, 2703, 4487
    - beetles and weevils, 1648d, 2705, 2707, 2709, 3334, 3956c
    - fly (*Agromyza phaseoli*), 1647w
    - garden springtail (*Bourletiella hortensis*), 3787
    - leafhopper (*Circulifer tenellus*), 3864
    - mites, 365, 2651

Beans—(*Phaseolus*)—pests (*continued*)—
    nematodes, 2702
    seed fly or maggot (*Delia* (=*Hylemyia* =*Chortophila*) spp.), 1583, 1584, 1647i
    thrips, 542z
    white fly, 2704
    wireworms, 3871
  physiology—
    protein metabolism, 1574, 1575
    temperature responses, 463, 2686, 3855, 3917
    translocation, 21
    water relations, 415, 2637, 3917
  pod storage, 2322f, 2635, 3861
  pollination, 2686
  processing, 408
  research in Switzerland, 1044
  root cell growth, 2145
  root nodule formation, 2687
  runner-type, poles for, 3956i
  runner-type as windbreak, 1500
  seed—*see also above*, composition *and* growth substances—
    coat development, 3869
    germination, 3444i
    injury, mechanical, 2683
    production, 3769
    rates and spacing, 3770, 3858, 4489
    storage, 2705, 4490
    threshing, 1647s
    treatments, 459, 460, 1583
  soil management—
    irrigation, 415, 1128, 1506, 2638
    mulching, 3774
    weed control, 375, 2561, 2607, 3756
  spray residues, 2650
  storage—*see above*, pod *and* seed
  varieties, 408, 1559, 1560, 2622, 2679, 2680, 2838k, 3308, 3856, 3858, 4480
Beans, velvet, 2078t
Beans (*Vicia*)—
  diseases, fungus, 1417, 1419
  diseases, virus, 2855
  growth, shoot asymmetry, 1568
  nutrition—
    minor elements, 466
    phosphorus, 2178
    potassium, 1572
    salt uptake, 1115
  pests, aphids, 2703
  pests, beetles and weevils, 1585, 3956c
  processing, 408
  root type, nutrient absorption varies according to, 2178
  seed production, 3769
  soil management, irrigation, 164
  soil management, weed control, 2561
  stomatal guard cells, 2161
  varieties, 408, 4487
*Beauvaria densa*, 3667
Beaverlodge Dominion exp. Stat., Rep., 3297
Bees—
  foraging habits, 3424, 3490
  herbicides injure, 3678
Bees (*continued*)—
  insecticides injure, 1427, 3678
  pollination by, 443, 448, 3432, 3490-3492, 3539n
Beet(root)—
  diseases, fungus, 1603, 1606
  diseases, virus, 1605, 2838p
  growth, top-root correlations, 2762
  nutrition—
    foliar, 3702
    manuring, 414, 1606
    molybdenum, 3903
    salt tolerance, 3779
  pests, insect, 1604
  pests, nematode, 3893
  physiology, 2148, 3886
  root fumigation, 3893
  seed production, 3769, 3886
  seed rates and spacing, 485
  soil management, weed control, 1059, 1482, 2558, 2561, 2600, 2608-2609, 3702, 3755
  spinach—*see* Spinach-beet
Begonia—
  composition, 4099
  growing in Ceylon, 1767
  growing under constant mist, 2927
  photoperiodic response, 657
  propagation by seed, 2162
  research in Belgium, 618
  temperature responses, 657
Belgian Congo—
  agricultural research, 3104
  cacao growing and research, 1938
  flora, 2086
  I.N.E.A.C., A.R., 834
  I.N.E.A.C., guide to, 3328
  Keyberg Stat., work at, 3329
  pyrethrum growing, 615m
  sugarcane growing, 4446c
  tannin plants, 4065
  vegetable growing, 407
Belgium—
  apple growing and varieties, 3539g
  cyclamen growing, 2958
  education in tropical agriculture, 3101
  flora, 3323j
  fruit growing and research, 2213, 2322g
  glasshouses, 79v
  horticultural research, 1068
  I.R.S.I.A., Rep., 4473
  mushroom growing, 2716
  ornamental plant research, 618
  plant pathology research, 2112
  soilless culture, 79v
  strawberry growing, 244c, 3550
  tobacco growing, 1655
  vine growing, 3557
*Bellis perennis*, gigas forms, 3357
*Belonolaimus gracilis*, 309, 2648
*Bemisia tabaci*, 2987
Ber—*see Zizyphus jujuba*
*Berberis polyantha* and *B. prattii* relationship, 2990
*Berberis thunbergii*, seed treatment, 4141

- Berlin-Dahlem, Horticultural College, 3
- Bermuda Dep. Agric., A.R., 1061b
- Berncastel Inst. f. Weinbau, 220
- Bibliographies on—
  - agricultural books, 1145a
  - bacterial wilt (*Pseudomonas solanacearum*), 1512
  - cacao, 4285
  - coffee, 901, 912, 1978
  - coffee rust, 912
  - design of trials, 3340
  - guava, 4447g
  - minor elements in nutrition, 3403
  - olive, 1892
  - plant protection, 2081
- Bicarbonate, chlorosis induced by, 2147
- Biennial bearing in—
  - apple, 169, 2288, 2291, 2292, 3514
  - citrus, 4212
  - coffee, 4330
  - hazel, 3572f
  - macadamia, 1891
  - mango, 3172
  - olive, 1901
- Biologische Bundesanst. Braunschweig, work at, 2429, 4462
- Biological control—*see* Pest control *and* Weed control
- Bird(s)—
  - control, 356, 1400-1403
  - scarers, 1058, 3662
  - sparrows, 1402
  - starlings, 1403, 3662
- *Biston suppressaria*, 3270h
- Biuret injury to plants, 4167
- Blackberry—
  - composition, fruit, 1211
  - diseases—
    - bacterial, 3603
    - fungus, 2324
    - in the U.S.A., 3690f
    - virus, 247
  - pests, 3644
  - spray residues, 371
  - varieties, 218, 2324, 3540
  - wild, control, 1468, 1479
- Black currant—*see also Ribes*—
  - certification, 3574
  - composition, fruit, 1211, 2305
  - diseases, fungus, 1350
  - flower development, 3541
  - flower and fruit drop, 1237
  - growing in Canada, 1048
  - nutrition, manuring, 3541
  - pests, insect, 2491, 2502
  - pests, nematode, 372i
  - pollination, 1238
  - spray residues, 371
  - storage of fruit, 217
  - varieties, 207, 1159, 3540
- *Blanjulus guttulatus*, 439
- *Blastomyces luteus*, 3944
- *Blastophaga* sp., caprification by, 3494
- *Blissus leucoptorus*, 1783
- Blossom thinning—*see* Thinning
- Blueberry—
  - composition, fruit, 1211
  - diseases, bacterial, 1334
  - diseases, fungus, 302, 2458, 2459
  - drought injury, 2428, 2545h
  - growing in Canada, 1048
  - growing in Denmark, 203
  - nutrition, 2545h, 4453
  - pests, birds, 356
  - pests, insects, 2509, 2510
  - pruning, 2428
  - research at Kentville, 202
  - soil management, weed control, 2592
  - varieties, 1159, 3572n
- *Boarmia rhomboidaria*, 3652
- *Bocconia pearcei*, 2876
- *Boehmeria* spp.—*see* Ramie
- *Boletin del Instituto de Ciencias Naturales*, a new periodical, 2118
- *Boletus edulis*, 1591
- Bolivia, vegetable growing, 3955e
- Bolting in cabbage, 433
- *Bombax ceiba*, 1707
- Book-keeping, farm, 1061k
- Book reviews—*see* Reviews
- Boron—
  - -calcium relationship, 697
  - determination, 2208h, 2208p
  - foliar application, 3502
  - herbicidal use of, 3701
  - growth substance translocation hastened by, 4490
  - nutrition of—
    - apple, 253
    - bean, 3862
    - brassicas, 435, 3804
    - celery and celeriac, 441, 2666, 3821
    - citrus, 4196, 4215
    - fruit crops, 3502, 4453
    - hops, 2897
    - oil palm, 4352
    - olive, 253
    - peach, 253
    - pear, 2272, 2403, 2405, 3502, 4490
    - pecan, 2386
    - plum, 253
    - poinsettia, 722
    - rose, 697
    - tobacco, 3998
    - tomato, 2810, 2811
    - vegetables, 1503, 1508, 3301
    - vine, 2404
  - sources of, 2180
  - sugar translocation affected by, 30, 40
  - tolerance and toxicity, 3862
- Boskoop Soc. Trial Garden, Yearbook and A.R., 617
- Botanic(al)—
  - Congress, Stockholm, 7th int., 3282
  - Garden—
    - Adelaide, A.R., 3323o
    - Batum, 2125
    - Santa Barbara, A.R., 2119h

Botanic(al) (*continued*)—
  nomenclature, 2094
Botley Fruit Stat., A.R., 1244
*Botryosphaeria ribis* (*Dothiorella* sp.), 283, 359, 789, 793, 1817, 4173
*Botrytis*—
  *allii*, 478, 2757
  *cinerea* on—
    bean—*see also below, fabae*—1419
    blueberry, 302, 2458, 2459
    carrot, 488
    citrus, 789
    cyclamen, 660
    lettuce, 1537
    onion, 478
    stock, 2953
    strawberry, 303, 2468, 3619, 3620, 3674
    tomato, 2099, 3932
    vine, 1356, 2477, 2478
  *fabae*—*see also above, cinerea* on beans—1417, 1419
  *paeoniae*, 478
  sp. on tomato, 500
  *squamosa*, 543k
  *tulipae*, 478, 1777
Bouché-Thomas method of growing fruit trees, 2083
*Bougainvillea* chimaera, 4163e
*Bourletiella hortensis*, 3787
Boxwood, garden forms of, 1813j
Boxwood pests, 4145, 4146
Boysenberry growing in Australia, 4482
Boysenberry mulching, 3416
*Brachyrhinus* spp. on small fruits, 1381
Bracken (*Pteridium aquilinum*) control, 2564
Branch abscission, 23
Brandon, Manitoba, Domin. exp. Fm, Progr. Rep., 4463
Brassica(s)—*see also under* Crucifers *and individual crops*—
  breeding, 4472
  composition, molybdenum, 3805
  diseases, resistance to, 1509
  diseases, various, 1513, 1648e, 3955i
  pests, 1648e
  physiology, 3383
  seed production, 4472
  seed treatment, 1607
*Brassolis* spp. on coconuts, 3150
Braunschweig, biol. Bundesanst. Land- u. Forstw., work at, 2429, 4462
Brazil—
  avocado growing, 832v
  cacao growing, 1932
  cider making, 96
  coffee growing, 902, 2078g, 2079d
  dry zone, crops for, 3278
  medicinal plants, 4006
  nurseries, 3444e
  vine growing, 2355
Breadfruit propagation, vegetative, 4267
Breeding, plant—*see also* Polyploidy *and individual crops*—
  age of parent affects progeny, 1157
Breeding, plant (*continued*)—
  in Canada, 1813o, 4484
  in Holland, 3764, 4472
  in Sweden, 2226
  of vegetable crops, 2909
  X-ray and other radiation treatments in, 3451-3453, 3842, 4098
*Brevicoryne brassicae*, 1523, 3811, 3812
*Brevipalpus*—
  *inornatus*, 710
  *lewisi*, 3060, 3061
  sp. on pecan, 1371
Brinjal—*see* Eggplant
British—
  Columbia—*see also under* Canada—agric. Statistics, A.R., 3323c
  Commonwealth, agriculture, 1069
  Guiana, plantation crops, 4268
  Guiana, sugarcane research and varieties, 4368, 4446g, 4446h
  Honduras, Dep. Agric., A.R., 4464
  West Indies—
    agricultural education, 3327
    Sugar Ass., Handbook, 3198
    centr. Sugar Cane Breed. Stat., Barbados, A.R., 4367
Broccoli—*see also* Cauliflower—
  composition, 1505
  diseases, 1539, 1540, 2642
  harvesting, 3801
  leaf meal, chlorophyll from, 1055
  nutrition, 3801
  pests, 542e
  soil management, irrigation, 1128
  varieties, 3760
*Brodiaea* corm storage, 4100
*Brontispa longissima*, 898
Broomrape—*see Orobanche*
Brown rot diseases—*see also Sclerotinia and host plants*—a manual on, 3612
*Bruchus*—
  *obtectus*—*see Acanthoscelides obtectus*
  *pisorum*, 2706, 3956c
  *rufimanus*, 1585, 2705, 3956c
Brussels sprouts—
  breeding, 3764
  composition, 2137, 2208k, 2658
  flower formation, 3799
  growing in Great Britain, 2838z
  growing in the U.S.A., 430
  nutrition, 2636, 3803
  pollination, 543j
  temperature responses, 3799
  varieties, 2838o, 2839a, 3760, 4480
Bryn Adda Hort. Demonstr. Stat., work at, 1062, 4479
*Bryobia praetiosa*, 246, 2487, 3689b, 3690p
*Bryophyllum* spp.—
  crown gall, 35
  gigas forms, 3357
  growth rhythm, 4130
  growth substance responses, 4129
  light responses, 4128
Buckthorn (*Rhamnus cathartica*), 2985

- Buds, nutrient transport to swelling, 2208e
- Budding—*see also* Budwood *and separate plants*—
  - chip, of walnut, 1293
  - double shield, 3468
  - histology of union in, 2979
  - plastic wraps for, 201n
- *Buddleia* spp., natural distribution of, 4162h
- Budwood, hardiness, position affects, 1185
- Budwood storage, 1800, 4292
- Bulb(s)—*see also individual species*—
  - diseases, 3674
  - forcing, 3321
  - growing—
    - in Algeria, 2955
    - a book on, 3271
    - in Holland, 2956
    - and research in Great Britain, 2, 2104
    - in the U.S.A., 1747
  - hot water treatment, 1776
  - liming, 50
  - pests, nematode, 1776
  - research in New Zealand, 1047
  - soil management, mulching, 55, 3416
  - soil management, weed control, 2581, 2597
  - storage, 1770, 1778, 3699, 4117, 4163b, 4490
- Bulgaria, medicinal plants of, 585
- *Bulletin scientifique*, a new periodical, 3322
- Bulrush control, 3727
- Bundesanst. Qualitätsforsch. pflanzl. Erzeugn., Geisenheim/Rheingau, Rep., 3298
- Bush fruit—*see* Small fruit
- *Butea monosperma*, 1707
- *Buxus*—*see* Boxwood

- Cabbage—
  - air pollution affects, 1084
  - bolting, 433, 3308
  - breeding, 3763
  - Chinese, 432, 1531, 3798, 3808
  - climate, temperature responses, 432, 3798
  - composition, 1505, 1530, 2660, 3808, 3809
  - diseases—
    - bacterial, 1536, 3783, 3813
    - fungus, 1536, 1541, 2642, 2664, 3419
    - non-parasitic, 2113
    - virus, 437, 3810, 3812
  - flower initiation, growth substances inhibit, 2659
  - growing in the tropics, 1531
  - growth, growth substances affect, 2659
  - growth, insecticides retard, 3817
  - labour requirements, 1489
  - nutrition—
    - boron, 3804
    - foliar, 3802
    - iron, 1502
    - manuring, 414, 2807, 3777, 3816
    - nitrogen, 2640, 3802
    - salt tolerance, 2413, 3779
  - pests—
    - aphid (*Brevicoryne brassicae*), 1523, 3811, 3812
- Cabbage—pests (*continued*)—
    - *Blanjulus guttulatus*, 439
    - butterfly or worm (*Pieris* spp.), 3667, 3697, 4483
    - diamond back moth (*Plutella maculipennis*), 440, 2655, 3697
    - fly (root) (*Erioischia* (=*Hylemyia*=*Chortophila*) *brassicae*), 438, 439, 1537, 1542, 1544, 3816, 3955o
    - looper (*Trichoplusia ni*), 2655
    - weevil (*Ceuthorhynchus* spp.), 1545, 1611, 3814
  - physiology and metabolism, 2168
  - planting, spacing, 1532, 1533, 2838i, 3760
  - propagation by cuttings, 3800
  - red, composition, 2660
  - red, pigments, 2168
  - research in the U.S.A., 2101
  - seed—
    - production, 1530, 3769, 3800, 3811
    - sowing date, 1529
    - yield, growth substances increase, 2659
  - seedlings, raising of, 3772
  - soil management, irrigation, 1506
  - soil management, weed control, 2600, 3708
  - spray residues, 3788, 3818
  - storage, 3522, 3819
  - varieties, 1528, 1648a, 3760, 3763, 3798, 3956 l
- Cacao—*see also Theobroma*—
  - bean—*see also below*, fermentation—
    - composition, 872, 873, 877, 3124, 3137
    - husks, uses of, 4308
    - insecticide contamination, 1956
    - meal as stock feed, 4446a
    - moulds, 4307
    - pigments, 1966, 3123
    - quality, 1932, 1965, 1967, 1969
    - yields, growth substance sprays affect, 859
    - yields, sampling for, 860
  - bibliography, 4285
  - books on, 1030, 3274
  - breeding and selection, 858, 1016d, 1932, 1943, 1944, 3269o, 4288
  - cherelle wilt—*see below*, fruit drop
  - climate, rainfall, 3127
  - clones, 859, 860, 1946, 1948, 2078m
  - collecting expedition, 1941
  - *en Colombia*, a new periodical, 3320
  - composition, bean—*see above*, bean
  - composition, leaf, 1950, 1951, 1953
  - diseases—
    - fungus—
      - bean moulds (*Aspergillus* spp. and others), 4307
      - black pod (*Phytophthora palmivora*), 1957-1961, 3136, 3137, 3148, 4269, 4305
      - monilia pod rot (*Monilia roreri*), 3134
      - stem canker (*Phytophthora faberi*), 3135
      - witches broom (*Marasmius perniciosus*), 878, 1016b
    - general, 3131

- Cacao—diseases (*continued*)—
    - non-parasitic, leaf scorch, 1953
    - virus—
        - in Ceylon, 1955
        - swollen shoot, 1932, 2103, 4304
        - in Trinidad, 874-876
        - vectors, 874, 1956, 3132
- fermentation and drying, 858, 881, 1016s, 1017k, 1030, 1932, 1965-1968, 4306, 4307
- flower drop, sprays cause, 3129, 3130, 4303
- fruit drop and set, 870, 871, 1954, 3126, 3127, 3129, 3133, 4297-4299, 4301
- fruit, parthenocarpic, 4302
- growing—
    - in Brazil, 1932
    - in British Guiana, 4268
    - in the Cameroons, 4286
    - under coconuts, 4289
    - in Colombia, 1935, 3119-3121
    - in the Far East and South Pacific, 1030, 2078p, 4289
    - in French West Africa, 4286
    - in the Gold Coast, 1936
    - in Liberia, 2078w
    - in Nigeria, 4286
    - in San Tomé and Principe islands, 1016w
- growth—
    - cuttings *vs* seedlings, 863
    - light intensity affects, 866
    - regeneration, 1963
- husks—*see above*, bean
- leaf composition, 1950, 1951, 1953
- nutrition—
    - chloride toxicity, 1953
    - foliar, 867, 871, 3133, 4296-4298
    - iron, 1952
    - manuring, 859, 1948, 4299
    - mineral, studies on, 867, 868, 1947, 1951
    - shading affects, 866, 1949
    - zinc, 1958
- pests—
    - ants, 1957
    - capsids (*Distantiella* and *Sahlbergella* spp.), 879, 1962, 1963, 4269
    - cockchafers (*Apogonia* and other spp.), 880
    - in Colombia, 3138
    - mealy bugs—*see also above*, diseases, virus vectors—1964
- physiology, assimilation rate, 863
- physiology, enzyme activity, 869, 3125
- planting—
    - intercropping, 1937, 1938
    - methods, 1937, 4293
    - spacing, 862
- pod—*see above*, fruit
- pollination and pollen germination, 858, 870, 3125, 3126, 3129, 3130, 3270g, 4300, 4301, 4303
- production and trade, 853, 1914, 1933, 1934
- propagation—
    - by budding, 861, 4292
    - by cuttings, 861, 863, 1945, 3128, 4290, 4291, 4293

- Cacao—propagation (*continued*)—
    - by grafting, 861
    - by marcotting, 861
    - method, tree performance affected by, 859
- research—
    - in the Belgian Congo, 834, 1938
    - in Colombia, 3311, 4287
    - in Costa Rica, 1940
    - in French West Africa, 4288
    - in Indonesia, 4272
    - Inst., West African, A.Rs, 854-856
    - in Jamaica, 836
    - in Malaya, 1915, 1937
    - in Nigeria, 4269
    - in Trinidad, 1024, 1939, 3118, 3313
- root systems, 4295
- rootstock-scion relationships, 1946, 1948, 4294
- shading, 866, 1937, 1938, 1948, 1949
- soil(s)—
    - deterioration, 857
    - management—
        - experiments, 864, 1948, 4295
        - mulching, 859, 865
        - weed control, 3747, 3748
    - types, 4295
- spray damage, 3129, 3130, 4303
- sterility, 1932
- surveys, 1936
- tissue culture, 3122
- tree ages, 1936
- varieties—*see also above*, clones—seedling Amelonado, 1942

- *Caesalpinia* spp. as tannin plants, 842
- Caesium, radioactive, 2176
- Caffeine—*see also individual crops under* composition—determination, 1017a
- *Cajanus cajan*, 1015
- Calcium—*see also* Liming—
    - -boron relationship, 697
    - cyanamide as systemic insecticide, 1522
    - determination, 3443g, 3444h
    - gluconate for plant injection, 517
    - foliar application, 517, 1546, 2962
    - nutrition of—
        - avocado, 777, 4168
        - carrot, 50
        - celery, 1546, 3823
        - chestnut, 1287
        - citrus, 777, 4197
        - endive, 50
        - fruit crops, 4453
        - gladiolus, 2962
        - iris, 50
        - poinsettia, 722
        - rose, 697
        - strawberry, 50
        - sugarcane, 975, 2052, 4377
        - tomato, 517
        - tulip, 50
        - tung, 3095, 3096
        - vine, 3301
    - radioactive, 2176
    - uptake of other elements affected by, 2052

California—*see also under* United States—Dep. Agric., A.R., 4465
*Caliroa cerasi*, 2545w
*Caliroa limacina*, 340
*Calliopsis* sp., growth substance affects, 2691
*Calliptamus* spp., as pests of crops, 3660
*Calluna vulgaris*, ornamental, 2995
*Calomycterus setarius*, 1750
Camellia—
  diseases, 714, 1800, 2991, 3011b, 3308, 4490
  flower bud differentiation, 713
  pests, 4148
  propagation by cuttings, 1800, 4070, 4147
  propagation by grafting, 712, 4489
  research in the U.S.A., 2101
  *sasanqua*, 726
  varieties, 726, 3011y
  *Year Book, roy. hort. Soc.*, 726
Cameroons Develop. Corp., A.R., 2119b
*Campanula* photoperiodic and temperature responses, 2933
Camphor (*Cinnamomum camphora*), 2884
Camphor basil (*Ocimum* spp.), 2890
Canada—*see also individual provinces and exp. stats*—
  apple growing, 2246, 2247
  breeding horticultural plants, 1813o, 4484
  chrysanthemum growing, 4086
  Dep. Agric. Fruit and Veg. Res. Cttee, A.R., 4466
  flower growing and varieties, 1048
  fruit growing, research and varieties, 97, 1048, 1180, 1184, 1203, 2102, 3306
  hedges, ornamental, 1791
  hop growing, 207
  horticultural organizations, 1145q, 1145r
  horticulture and horticultural research, 1042, 1043, 1070, 1071, 2123
  Minist. Agric., A.R., 1037
  tobacco growing and research, 1070, 3958
  vegetable growing and varieties, 1048, 2623, 3306, 3956 l
  woody ornamentals in, 1048
Canaigre (*Rumex hymenosepalus*), 1057, 2868
*Canavalia ensiformis*, 4332
Candlenut (*Aleurites moluccana*), 841
Canna as a fibre plant, 1722
Canna storage, winter, 1768
*Cannabis sativa*, diseases and pests, 4028
Canning—*see separate crops under* processing *or* products
Cantaloup—*see under* Melon
Canterbury agric. Coll., N.Z., A.R., 1061c
*Cantharellus cibarius*, 1591
Cape gooseberry (*Physalis peruviana*), 2325, 2326
Capparidaceae of Argentina, 4068k
*Capsicum*—
  breeding and genetics, 3763
  composition, ascorbic acid, 539
  diseases—
    bacterial, 1512
    fungus, 526, 1642, 3953
    market, 514
*Capsicum*—diseases (*continued*)—
    resistance, 1509
    virus, 1635, 2835, 2837, 3950
  growing in—
    India, 2870
    Italy, 1642
    the U.S.A., 538
    Yugoslavia, 1492
  growth substance responses, 3922
  juice, virus inhibited by, 3952
  nutrition, 2808
  pests—
    insect, 540, 2836, 2837, 3954
    mite, 2837
    nematode, 541, 2648
  physiology, water relations, 3916
  pollination, 3951
  research in India, 4477
  taxonomy of cultivated species, 537
  varieties, 3308, 3763, 3956 l
Caraway (*Carum carvi*), 1699
Carbohydrates, metabolism, 508, 3444g, 3515
Carbohydrates, translocation in plants, 30
Carbon—
  dioxide—*see also* Photosynthesis—
    glasshouse crops' response to increased, 1504, 3426
    for hotbeds, 66
    for storage—*see* Storage, gas
  monoxide, flower development stimulated by, 3426
  monoxide, plant respiration stimulated by, 3362
  radioactive, 1145v, 2154, 3976
Cardamoms (*Elettaria*, *Amomum* and *Aframomum* spp.), 578, 1700
*Cardaria draba*, 3709, 3759j
*Carduus* spp., control, 1485i
*Carea subtilis*, 3140
*Carica*—
  *candamarcensis*, 3181
  *papaya*—*see* Papaw
  *quercifolia*, 4354
*Carissa grandiflora*, 4446z
Carnation—
  calyx splitting, 633
  diseases—
    bacterial wilt, 1813h
    fungus—
      general, 735o
      greasy blotch (*Zygophiala jamaicensis*), 1754
      mildew (*Peronospora dianthicola*), 635
      root rot and wilt (*Fusarium* and *Verticillium* spp.), 634, 4085
      rust (*Uromyces caryophyllinus*), 634
    virus, 2937, 4083, 4084
  flowers, malformations, 633, 1813e
  flowers, packing, 621
  growing under glass, 2934
  nutrition, 627, 630, 631, 735n, 2936, 3011v
  physiology, light responses, 1753
  physiology, temperature response, 633
  polyploid, 4490

- Carnation (*continued*)—
  - propagation by cuttings, 627, 628, 2935, 4070, 4082
  - soil—
    - fumigants injure, 636, 1755
    - management, watering systems, 629
    - moisture requirements, 632
  - soilless culture, 2934, 3011v
  - varieties, 629
- Carnauba (*Copernicia cerifera*), 3278
- Carob (*Ceratonia siliqua*)—
  - growing in various countries, 832d, 4179, 4180
  - nutritional value, 832m, 1912k
  - propagation, 753
- *Carolinaia cyperi*, 4410
- Carotene—*see also individual plants under* composition—
  - contents of plants, 3413, 3889, 4472
  - determination, 534, 2208s
  - extraction from palm oil, 3179
- Carotinoids—*see* Pigments, carotinoids
- *Carpocapsa pomonella*—*see* Codling moth
- *Carpomyia vesuviana*, 3840
- *Carpophilus* spp. on dates, 808
- Carrot—
  - breeding and selection, 2764
  - composition—
    - leaf, 4472
    - root, mineral, 1505
    - root, organic, 486, 3413, 3887, 3889, 4472
  - diseases, fungus, 488, 1648f, 2642, 2768, 2769, 3891
  - diseases, virus, 3785
  - nutrition—
    - calcium, 50
    - manuring, 1501, 3413, 3890
    - molybdenum, 3903
    - salt tolerance, 486, 1501
  - packing, 487
  - pests, insect, 543a, 1523, 1544, 1607, 3894, 3895
  - pests, nematode, 1519, 3892, 3893
  - physiology, tissue culture, 3888
  - processing, 408
  - root—
    - fumigation, 3893
    - morphology, 2765
    - removal of aseptic cylinders from, 1143
    - splitting, 3890
  - seed—
    - production, 2766
    - rate and spacing, 1610, 3955u
    - sowing dates, 3890
    - treatments, 3371
  - soil—
    - conditioners for, 411
    - management, mulching, 3774
    - management, weed control, 1485j, 2561, 2599, 2600, 3754
  - sprays, residues, 425, 3788
  - storage, 488, 2767, 3887
  - varieties, 408, 2765
  - wild, control, 1479
- *Carthamus tinctorius*—*see* Safflower
- *Carya* spp., wood anatomy, 2395s
- Cashew—
  - apple, 4443
  - growing, a review, 4446q
  - research in Jamaica, 836
- *Casimiroa edulis*, 4267
- *Cassia auriculata*, 1740, 4069o
- *Cassia fistula*, 4163h
- *Castanea*—*see* Chestnut
- Castor (bean)—
  - breeding and selection, 2909, 4058, 4476
  - by-products, 2915
  - composition, 1742b, 4060
  - flower, sex expression, 4059
  - growing—
    - in Argentina, 2905
    - in Morocco, 2907, 2908
    - in Peru, 1735
    - in Spain, 2906
    - in the Sudan, 2119j, 3312
  - hybrids, pistillate, 4058
  - inflorescences, removal of lateral, 2913
  - nutrition, 2912
  - oil, 2100, 2911
  - pests, 1736, 2914
  - polyploidy induced, 613
  - research in the Belgian Congo, 3104
  - seed threshing, 4061
  - soil management, irrigation, 2909
  - soil management, weed control, 1448
  - spacing, 2913
  - varieties, 2909, 2910, 4487
  - as a windbreak, 1853
- *Catacauma huberi*, 4361
- *Catalpa bungei*, 2984
- *Catalpa* spp., diseases, 2992
- *Cattleya* orchids—
  - diseases, 4163 l
  - pests, 4127
  - watering, 4126
- Cauliflower—*see also* Broccoli—
  - breeding, 3764
  - climate, frost damage and protection, 1314, 1535
  - climate, temperature responses, 2661, 2663
  - composition, 2209b, 2662
  - diseases—
    - bacterial, 1536
    - fungus, 1536, 2642, 3419
    - non-parasitic, 1538, 2663
    - virus, 436, 437, 542r, 1537
  - growing in—
    - Great Britain, 542o
    - the Philippines, 431
    - Yugoslavia, 1492
  - nutrition—
    - boron, 435, 3804
    - manuring, 414, 4480
    - molybdenum, 434, 1538, 3806, 3807, 3903, 3955s
  - pests, 1543, 1544, 2665, 3815, 3816
  - physiology, 3806, 4480
  - planting, spacing, 1534

Cauliflower (*continued*)—
  seed production, 1526, 3769
  soil waterlogging, 435
  varieties, 542m, 2627, 3760, 3955z, 4480
Cawthron Inst., N.Z., A.R., 1038
*Ceanothus velutinus*, 1801
Celeriac—
  growing in New Zealand, 406
  mulching, 3775
  nutrition, 3821
  weed control, 3754
*Celerio nerii*, 4310
Celery—
  composition, 542j
  diseases—
    fungus, 1547, 2642, 3822
    non-parasitic, 1546
    resistance, 1509
  flower initiation, growth substance promotes, 3820
  labour requirements, 1489
  nutrition—
    boron, 441, 2666
    calcium, 1546, 3823
    magnesium, 442
  pests, insect, 1521, 1548, 1607, 1647v, 1648h
  pests, nematode, 1519, 1547, 1549
  research in the U.S.A., 2101
  seed cleaning, 2869
  soil management, weed control, 1485j, 2611, 3754
  storage, 3824
Cell(s)—
  physiology, 18, 2140, 2145
  size, fruit keeping quality related to, 3445
  tissue culture from single, 3374
  ultrasonic vibrations affect, 3372
*Celosia* varieties, 4079
Cement dust, plants injured by, 819
*Centaurea* weed spp., control, 383, 3709
*Centrospora acerina*, 488
*Cephaleuros parasiticus*, 1012
*Cephalobus nanus*, 3581
*Cephalothecium roseum*, 2481
*Cerambyx dux*, 3640
*Ceratitis capitata*, 323, 454, 794, 1385, 1386, 1870, 1871, 2098, 2500, 3642, 3643, 3689h, 4276, 4487
*Ceratonia siliqua—see* Carob
*Ceratostomella fimbriata*, 911, 3131, 3168
*Cercospora*—
  *apii*, 3822
  *cladosporioides*, 1904
  *fusca*, 2481
  *hibisci*, 1592
  *kopkei*, 4403
  *longipes*, 1057
  *musae*, 1924, 1925
  *nicotianae*, 1678
  sp. on beetroot, 1603
  *unamunoi*, 3953
*Ceroplastes*—
  *destructor*, 1875
*Ceroplastes* (*continued*)—
  *rubens*, 4435
  *rusci*, 89, 3658
Certification schemes for planting material, 3574
*Cestrum nocturnum*, 2881
*Cetonia aurata*, 1380, 2545q
*Ceuthorhynchus*—
  *assimilis*, 3814
  *pleurostigma*, 1545, 1611, 3956e
  *suturalis*, 3955v, 3956h
Ceylon—
  coffee growing, 4323
  Dir. Agric., A.R., 833
  Rubber Res. Bd, A.R., 948
  tea growing and research, 998, 3247, 3249
  tobacco growing, 549, 3961
*Chaetadoretus cribratus*, 880
*Chaetodacus cucurbitae*, 3300
*Chalaropsis thielavioides*, 2982
*Chamaecyparis lawsoniana*, 2995, 2996, 4150
Changins sur Nyon exp. Stat., Lausanne, 1255
*Chara globularis*, control, 2572
*Cheimatobia brumata—see Operophtera*
Chelates—*see also* Iron—in plant nutrition, 3408
Chelates, wilt toxins in plants form, 3409, 3410
*Chenopodium ambrosioides*, 582
*Chenopodium hybridum*, 3950
Cherimoya (*Annona cherimola*)—
  fruit ripening, 3518
  growing in the Bahamas, 4267
  nutrition, iron, 4274
Cherry—
  blossoming, growth substances retard, 1198
  blossoms, stamen numbers, 1197
  breeding and selection, 1157, 1158, 3451
  climate—
    air pollution, 1325, 2414
    hail damage, 2427
    spring frost injury, 261, 2416
    winter injury and hardiness, 261, 3481
  composition, fruit, 1211, 1214, 2305, 2310, 2329, 3481
  composition, leaf, 201c, 1325
  diseases—
    bacterial, canker and leaf spot (*Pseudomonas* spp.), 3602
    cause unknown, allophylly, 1310
    fungus—
      blossom blight (*Sclerotinia* spp.), 1347
      *Cylindrosporium padi*, 1348
      leaf curl or witches' broom (*Taphrina cerasi*), 2460
      leaf spot or anthracnose (*Coccomyces hiemalis*), 300, 2535, 4483
      *Phytophthora cactorum*, 301
      rust (*Tranzschelia pruni-spinosae*), 3689f
      scab (*Venturia* (=*Fusicladium*) *cerasi*), 1349
    non-parasitic, 269
    in the U.S.A., 2113
    virus, 271, 272, 372h, 1328, 2112, 2430, 3597, 3598, 3689c, 4485, 4489

Cherry (*continued*)—
  fruit—*see also above*, composition, *and below*, harvesting—
    cracking, 2297
    malformation, 259
    size, factors affecting, 2310
  growing in France, 3446
  growing in Great Britain, 3539i
  harvesting, 201u
  herbicide injuries, 3740
  nutrition—
    manuring, 2273
    nitrogen, urea sprays, 3502
    potassium, 1059
    a review, 4453
  pests—
    birds, 3662
    blossom moth (*Argyresthia ephippella*), 1394
    *Cetonia aurata*, 1380
    *Cryptophasa unipunctata*, 327
    fruit fly (*Rhagoletis* spp.), 324, 1425, 2546g, 3690w
    *Hylocoetus dermestoides*, 1379
    leaf hoppers (*Colladonus geminatus*), 2432
    leaf miner (*Lithocolletis crataegella*), 372g, 1389
    scale, Forbes (*Aspidiotus forbesi*), 344
    slugworms (*Caliroa* spp.), 340, 2545w
    in the U.S.A., 2113
    winter moth (*Operophtera brumata*), 1394
  physiology, growth substance metabolism, 3380
  physiology of gum production, 2322c
  pollination, 128, 129, 133, 1195, 1196, 2254, 2258, 3451, 3493
  processing, pickling, 1236b
  processing, transport of fruit for, 3534
  products, juice, 3539k
  propagation—
    by cuttings, 1172
    by grafting, 110
    by layering, 2253
  rootstocks—
    in Australia, 3469
    mahaleb, 4489
    mazzard or sweet (*Prunus avium*), 2253
    *Prunus ussuriensis*, 3481
    in the U.S.S.R., 3484
  seed—
    embryo culture, 109, 2258, 4472
    germination, 108, 2241, 2242
    poisonous properties, 3516
  soil—
    management, cover crops and grass, 1205
    management, mulching, 3416
    sickness, 258
  spray—
    injury, 363, 4483
    programmes, 1299
    residues, 2541
  varieties, 201p, 218, 1164, 1197, 3493
Cheshunt exp. Res. Stat., A.R., 1061d
Chestnut—
  Chinese (*Castanea mollissima*), 239
  diseases, fungus—
    bark canker or blight (*Endothia parasitica*), 1364
    ink disease (*Phytophthora* spp.), 1365
    *Monochaetia desmazierii*, 2480
  horse (*Aesculus* sp.), 4149
  nutrition, calcium, 1287
  pests, 1383
  propagation from seed, 2395o
  propagation, vegetative, 240
  root system, 241, 2395f
Chicory—
  breeding, 3764
  diseases, 2112, 3902
  × endive hybrids, 543h
  forcing, 490, 1058
  growing in South Africa, 1701, 1742h
Chikoo—*see* Sapodilla
Chile, fruit growing, 4469
Chilli—*see Capsicum*
Chilling requirements of deciduous fruit trees, 4453
*Chilotraea infuscatellus*, 993, 4476
Chimaeras—
  induced, in fruit plants, 1097, 1154, 3452, 3453
  natural, in fruit plants, 136, 223, 3335, 3452, 3478, 4172
  in ornamental plants, 4163e
Chinese gooseberry (*Actinidia sinensis*), 1047
*Chionaspis furfura*, 3657
Chives pests, insect, 2761
Chloride—*see also* Salt—
  calcium and sodium, toxicity of, 153
  injury to—
    cacao, 1953
    fruit crops, 4453
    strawberry, 2411
    tobacco, 3998
  nutrition of spinach, 3906
  *vs* sulphate ions in plant nutrition, 1501
Chlorine, antibiotics inactivated by, 2698
Chlorine, radioactive, 2146
Chlorogenic acid in plants, 921, 4055
Chlorophyll, broccoli leaf meal a source of, 1055
Chlorophyll determination, 1145s
Chloroplasts, 1647a
Chlorosis—*see also particular plants and* Iron—
  bicarbonate-induced, 2147
  of plants, causes of, 1303, 3333
  lime-induced, control of—*see also* Iron—251
  lime-induced, plant reactions to, 41, 1302, 4168
Choline, role in plant metabolism, 1103
*Chondrodendron* sp., alkaloids, 1711
*Chortophila brassicae*—*see Erioischia brassicae*
Chromatography, paper, 79g, 79y
Chrysanthemum—
  *cinerariaefolium*—*see* Pyrethrum
  climate, frost resistance, 1757

- Chrysanthemum (*continued*)—
  - diseases—
    - bacterial, 647, 4091
    - fungus, 735v, 1758, 2643, 2941, 4092
    - virus, 424, 518, 646, 3011c, 3011d, 3011s, 4090
  - flower—
    - bud initiation—*see also below*, physiology—641
    - forcing, 4088, 4480
    - malformation, 1813e
    - packing and storage, 621
  - flowering, maleic hydrazide delays, 645
  - flowering, plant size affects, 639
  - growing, books on, 1036, 1061a
  - growing in various countries, 1756, 3011p, 4086
  - growth, growth substances affect, 2691
  - nutrition, 638, 735s, 2939, 2940
  - pests, insect, 2942
  - pests, nematode, 648
  - physiology—
    - light intensity response, 644
    - photoperiodic response, 639-641, 1813s, 2931, 2938, 4088, 4089
    - temperature response, 640, 642-644, 1813s, 2938, 4089
  - pinching, 645
  - polyploid, 3011k
  - propagation by cuttings, 2927, 4070, 4087
  - soil conditioner benefits, 637
  - soil management, weed control, 2581
  - stomatal guard cells, 2161
  - varieties and species, 4162i, 4162u, 4163g
- *Chrysomphalus dictyospermi*, 4239, 4264r
- *Chrysotypus* sp. on cloves, 4311
- *Cicer arietinum*, 1568, 3358
- Cider—
  - apple growing in Great Britain, 4451
  - apple varieties, 96, 3536
  - making, 96
- Cinchona—
  - growing in India, 4309
  - history, 2078v
  - pests, 4310
  - propagation, 4309
  - research in Indonesia, 4272
  - soil requirements, 1016z
- Cineraria pests, 735p
- *Circulifer tenellus*, 3864
- *Cirsium arvense*, 1485i, 3720
- Citation of literature, new system proposed, 3331
- Citric acid determination, 1087
- Citron—*see under* Citrus
- Citronella—*see Cymbopogon*
- *Citrullus fistulosus*, 1558, 3956b
- *Citrullus vulgaris*—*see* Watermelon
- Citrus—
  - anatomy, phloem, 3050
  - breeding—*see also below*, varieties—1820
  - by-products—*see below*, products
- Citrus (*continued*)—
  - climate—
    - atmospheric pollution, 3068
    - frost—
      - damage, 784, 785, 1852, 4217, 4218
      - insurance, 4264p
      - protection by—
        - fans, 1848
        - fans plus heaters, 1851
        - heaters, 766, 1851
        - smoke, 766
        - tent coverings, 766
      - resistance, inarching enhances, 3024
      - resistance, rootstock affects, 1830
    - and fruit size, 757
    - wind protection, 1853
  - composition—
    - fruit—
      - amino acids, 782
      - frost affects, 784, 785
      - of grapefruit, 783, 832j, 832k, 1890, 3045, 4215, 4219
      - of lemon, 1821, 3044
      - of lime, 3100i, 4214
      - of mandarin, 1846, 3046
      - of orange, 784-786, 1829, 1847, 2014, 3045, 3075, 3100p, 4187, 4213, 4219, 4220, 4264c, 4264g, 4264w
      - sprays affect, 786, 4215
    - leaf—
      - fluorine, 3068, 4203
      - in relation to nutrition, 4195, 4453
      - of lemon, 3034
      - of mandarin, 1846, 3037
      - of orange, 767, 768, 1208, 1837, 3033, 3034, 4204, 4220
      - rootstock affects, 3034
    - root, 4204, 4221
    - shoot, 2175
  - diseases and disorders—
    - cause uncertain—
      - creasing, 4220
      - crinkle-scurf, 1854, 3100 l
      - decline and sieve-tube necrosis in lemon, 4221
      - re-greening, 1835
      - spreading decline (nematode and *Fusarium* sp.?), 790, 791, 1865
      - Winter Haven decline (*Pythium* sp.?), 3057
    - fungus—
      - black rot or stylar end spot (*Alternaria citri*), 3074
      - blight or root rot complex (*Diplodia*, *Fusarium* and *Phoma* spp.), 1912e
      - blue and green moulds (*Penicillium* spp.), 195, 308, 801, 832 l, 1885, 1886, 3054, 4243, 4247
      - crown rot (*Sclerotium rolfsii*), 3058
      - damping-off or black leg (*Corticium*, *Sclerotinia*, *Pythium* and *Fusarium* spp.), 791
      - mal secco (*Deuterophoma tracheiphila*), 792, 1861, 3055, 3056, 4224, 4225

Citrus—diseases and disorders—fungus (*continued*)—
      melanose and stem-end rot (*Diaporthe* (*Phomopsis*), *Diplodia* spp., etc.), 195, 793, 1862, 1887, 1888, 3049, 3054
      scab or verrucosis (*Elsinoë* (*Sphaceloma*) *fawcetti*), 1862, 1863
      septoria spot (*Septoria depressa*), 1864, 1912a
      shell-bark and dry bark of lemon (*Diaporthe* (*Phomopsis*) and other spp.), 789, 3053
      storage rots, general, 3073
      wither-tip or anthracnose (*Colletotrichum gloeosporioides*), 1860
    in Israel, 832a, 832p
    non-parasitic, chlorosis, 251, 774, 775, 3038-3040, 4200-4202, 4274
    non-parasitic, yellow spot, 1840, 3100s
    virus—
      psorosis, scaly bark, lepra explosiva or leprosis, 4222
      scalybutt or exocortis of trifoliata, 1855, 1912f, 3100f
      in South Africa, 3021
      tristeza, quick decline, stem-pitting or root-rot, 787, 788, 1831, 1856, 1857, 3050-3052, 4223, 4265b
      vein enation, 832u, 1858
      xyloporosis or cachexia, 1859
    in Yugoslavia, 1912l
  economics, 754, 1851, 4181
  flower—
    bud differentiation, 4264a
    calyx abscission, histology, 803
    drop, factors affecting, 2096
    structure, abnormal, 1844, 1845
  frost—*see above*, climate
  fruit(ing)—*see also above*, composition, *and below*, harvesting, packing, products *and* storage—
    biennial, 4212
    colour—*see also below*, packing—soil moisture affects, 1835
    drop, factors affecting, 4206, 4207
    drop, growth substances retard, 3048, 4211, 4212
    enzyme activity, 1846
    ethylene production by, 3518
    ice nucleation in supercooled, 1852, 4218
    maturity, sprays affect, 3049, 4215
    maturity tests, 2014, 4216
    navel formation in orange, 1845, 3100k
    nematodes in rotting, 832n
    pigments, 1846
    quality—
      nutrition affects, 4213
      rootstock affects, 1827-1829, 1847, 4187
      sprays affect, 786, 4219, 4234, 4237
    respiration, 3071, 3518
    size—
      fluctuations in, 757
      growth substances increase, 4212, 4264z
      manures affect, 1912h, 4197, 4264z

Citrus—fruit(ing) (*continued*)—
    yields, factors affecting, 756, 1837
    yields, height of bud-union affects, 4189
  fumigation, soil, 795, 1866, 3067
  grading—*see below*, packing
  growing—*see also below*, rootstocks *and* varieties—in—
    Angola, 3299
    Australia, 3017
    British Guiana, 4268
    Egypt, 832b, 3100j
    houses, 1849
    India, 3100t
    Israel, 4181
    Japan, 3019
    Lebanon and Syria, 832c
    New Zealand, 1047
    North Africa, 4264n
    the South Pacific, 2078p
    Spain, 1912i, 4217
    trenches, 1850
    the U.S.A., 755
  growth—*see also below*, physiology—
    2,4-D affects, 3028, 3047
    dormancy induced, 1850
    height of bud-union affects, 4189
    root, 781, 4186, 4197
    of seedlings, 1841
    senescence, 778
    soil fumigation affects, 795, 1866, 3067
  harvesting, 195
  hybridization, vegetative, 3023
  irrigation—*see below*, soil management
  juice—*see above*, composition, fruit, *and below*, products
  leaf—*see also above*, composition—drop, sprays cause, 4234
  manuring—*see below*, nutrition *and* soil management
  nucellar—*see below*, varieties
  nutrition—
    aluminium, 3036
    biuret injury, 4167
    boron, 4196, 4215
    calcium, 777, 2175, 4197
    cations in relation to, 768, 1837, 2175
    copper, 774, 777, 1838, 1839, 4196, 4198-4200
    foliar, 1836, 2096, 4196, 4215, 4264z
    iron, 251, 774, 1838, 3038-3040, 4198, 4200-4202, 4274
    leaf and soil analyses as guides to, 4195, 4453
    lime-induced chlorosis, 3039, 3040, 4201
    magnesium, 769, 776, 2175, 4197
    manganese, 758, 774, 1836, 1838, 1839, 3041, 4196, 4198
    manuring—*see also below*, soil management—
      fertilizer placement, 832i
      general, 3100a, 3100q, 4264v
      of limes, 4166, 4214
      of oranges, 4192, 4193, 4213
      by soil injection, 2275

Citrus—nutrition (*continued*)—
- mineral deficiency symptoms, 1208
- molybdenum, 777, 1840, 3100s
- nitrogen, 763, 769-771, 832i, 1836, 2096, 2175, 3034, 3035, 3100a, 4167, 4194, 4207, 4224
- phosphorus, 772, 773, 3036, 4195
- potassium, 769, 1912h, 2175, 4195
- reviews, 4453
- sodium and salt tolerance, 4204, 4221
- sulphur, 3042
- zinc, 774, 1838, 1839, 3043, 4196, 4198

oil—*see below*, products

orchard management—*see below*, soil management

packing—*see also below*, storage—
- boxes and cartons for, 1231, 3100r
- bulk containers for, 9
- grading, colour sorting, mechanical, 1883
- grading, tables, 4244
- methods, 800, 4181

pest(s)—
- ants, 2654, 4228
- aphids (*Aphis*, *Toxoptera* and other spp.), 1521, 1867, 1868
- in Argentina, 1912p
- in Australia, 4264q
- beetle borers, 3059
- black fly (*Aleurocanthus woglumi*), 1056
- control, biological and ecological—*see also below*, scale control—1876, 1877, 1912d, 4264 l, 4264s
- cutworm (*Xylomyges curialis*), 4229
- fruit flies (*Anastrepha*, *Ceratitis* and other spp.), 794, 1386, 1387, 1869-1871, 3642, 3689h, 4264d, 4264q, 4465
- grasshoppers (*Schistocerca* sp.), 1872
- in Jamaica, 836
- mealybug (*Pseudococcus* sp.), 1877, 4239
- mite—
  - brevipalpus or flat (*B. lewisi*), 3060, 3061
  - bud (*Aceria sheldoni*), 3060, 4231, 4233
  - red or purple (*Metatetranychus citri*), 1873, 1912o, 3060, 4230, 4233, 4236, 4264s
  - rust or Maori (*Phyllocoptruta oleivora*), 3060, 4264q
  - six-spotted (*Tetranychus sexmaculatus*), 3060, 4230, 4264s
  - yuma (*Tetranychus yumensis*), 3060
- nematodes, 795, 832n, 1865, 1866, 3066, 4226
- orange tortrix and other orange worms (*Argyrotaenia citrana*, etc.), 799
- rodents, 1881, 1882
- scale—
  - black (*Saissetia oleae*), 797, 1912d
  - chaff (*Parlatoria pergandei*), 4264r
  - citricola (*Coccus pseudomagnoliarum*), 796
  - control, biological, 4227, 4240
  - control, chemical, 1056, 1912n, 4232, 4235-4239, 4264q

Citrus—pest(s)—scale (*continued*)—
- cottony cushion (*Icerya purchasi*), 796, 1870
- dictyospermum (*Chrysomphalus dictyospermi*), 4239, 4264r
- olive (*Parlatoria ziziphi*), 4239, 4264r
- purple (*Lepidosaphes beckii*), 3062, 3063, 4237-4239, 4264r
- red (*Aonidiella aurantii*), 758, 1874, 1912n, 3064, 3697, 4232, 4235, 4236
- soft brown (*Coccus hesperidum*), 796
- white louse (*Unaspis citri*), 4264q
- white wax (*Ceroplastes destructor*), 1875

snails, 1411

in Spain, 4227

termites, 3065, 4264h

thrips (several species), 798, 1300, 1867

white fly (*Aleurocanthus* and *Aleuroplatus* spp.), 1912m

in Yugoslavia, 1912 l

physiology—
- electric conductivity of branches, 778
- enzyme activity, 790, 1846
- light responses, 3033, 3037, 3045
- net assimilation rates, 1841
- photoperiodic responses, 780
- photosynthesis, factors affecting, 779, 3047
- respiration—*see also above*, fruit—779, 790
- transpiration, 1834
- water relations, 1842, 4487

planting in old citrus soils, 768, 795, 1866

pollination—
- with lily pollen, 3100u
- with mixed pollen, 762, 1843
- seed formation in seedless fruits induced by, 762

polyembryony, 1912c

production and/or trade—
- Germany, 201e
- Israel, 4181
- Japan, 3019
- Mediterranean, 4265f
- U.S.A., 754, 3326, 4182
- world, 4265c

products and by-products—
- fodder, 832t, 842
- general, 754, 805, 1889, 4181
- juice—*see also above*, composition, fruit—
  - concentrated, 4264w
  - extraction, 4264c
  - lime, characteristics of, 3100i
  - rootstock affects, 1827
- oil, lime, 842, 1050
- oil, orange, 4248
- pectin, 3076
- riboflavin, 4249
- wine, orange, 4446z

propagation—
- by budding or grafting, 3020, 4188, 4189
- by cuttings, 760
- by inarching, 3024
- by marcotting, 4205
- nursery methods, 3029
- by top-working old trees, 761

Citrus (*continued*)—
  pruning, 3031, 3032, 4207
  research in—
    Australia, 2109, 4482
    the Belgian Congo, 834
    India, 2108, 4476, 4477
    Indo-China, 1045
    Trinidad, 839
    the U.S.A., 2101
  ringing, 3050, 4205, 4207-4210
  roots—*see also above*, growth—fungi associated with, 791
  rootstocks—*see also above*, growing, *and below*, varieties—
    *Citrus combava* and *C. hystrix*, 1857
    Cleopatra mandarin, 3037
    *Feronia elephantum*, 4476
    frost resistance affected by, 1830
    fruit quality affected by, 1827-1829, 1847, 4187
    for grapefruit, 3018, 3026
    growth rates, comparative, 1841
    identification, methods of, 1825, 1826, 4185
    in India, 4476
    for mandarins, 759, 3026, 4207
    in Nigeria, 4269
    for oranges, 1828, 1829, 3018, 3025, 3026
    reviews on, 4184
    Rangpur lime (mandarin), 1824
    root systems, 781, 4186, 4197
    sour orange, 1826, 4185
    -scion relationships, 3034
    in South Africa, 3018
    trifoliate orange, 832e, 1850, 3023, 3024, 4189
    tristeza relationships—*see also above*, diseases, virus—1857
    in Trinidad, 3020
    xyloporosis relationships, 1859
  scion rooting induced, 1831
  seed—
    formation induced in seedless fruits, 762
    germination, 1823, 1824, 3027
    production, 762
    testing, 1822
    treatment, 3027
  shade responses, 1850
  soil(s)—
    management—
      cover cropping, 763, 3018
      fumigation, 795, 1866, 3067
      green manuring, 1832, 3029, 3030, 4190
      irrigation, 164, 756, 758, 764, 765, 1833, 1834, 2096, 2196, 3018, 4166, 4191, 4207
      manganese status affected by, 758, 3041
      methods in New Zealand, 4264e
      non-tillage, 758, 4190
      weed control, 2559
    pH affects, 3034, 3037, 3042
    old—*see above*, planting
    water requirements, 1835
  species, taxonomy, 3100g

Citrus (*continued*)—
  spray(s) (ing)—
    fruit maturity affected by, 3049
    injuries, 1879, 4234
    oil fractions compared, 4232-4234
    programmes, 4219
    residues, 3100o, 3685
  storage—
    calyx abscission delayed by growth substances—*see also below*, storage life—1884
    chemical changes during, 3044
    colour development during, 4242, 4243
    dips and coatings, 195, 801, 1885, 1886, 3069, 3517, 4246
    ethylene damage to Temple orange, 804
    ethylene emission by moulds, 4243
    gas, 802
    life, 2,4-D and 2,4,5-T prolong, 803, 3071, 3517
    life, factors affecting, 3070, 3517
    respiration in, 3071
    rots—*see above*, diseases, fungus
    temperatures, 1057, 3069, 3070, 3073, 4242, 4490
    wraps, 1885, 1886, 2383, 3072, 3073, 4245
  tree snail, beneficial, 4241
  tree thinning, 764
  varieties—*see also above*, species—
    general—
      collections, 3102
      in the Mediterranean basin, 4264f
      in North Africa, 201p
      nucellar strains, 759, 3021
    grapefruit, new, 1912j
    grapefruit, in Trinidad, 3020
    lemon, Meyer, 1821
    lime, 3020
    mandarin, 759, 4183, 4208-4210
    orange—
      in Italy, 832r
      nucellar strains, 1820, 3022
      in Trinidad, 3020
*Cladius pectinicornis*, 2545b
*Cladosporium*—
  *carpophilum*—*see Fusicladium carpophilum*
  *cucumerinum*, 1554
  *effusum*, 307, 2481, 2532
  *fulvum*, 543f, 1417, 1638, 2788, 2823-2825, 3939
  sp. on fig, 1355
*Clappertonia filicifolia*, 1720
*Clasterosporium carpophilum*, 2466
*Clastoptera* (=*Cercoptera*) *achanita*, 350
*Clemora smithi*, 3237, 4413, 4447u
Cleppa Park Hort. Demonstr. Stat., work at, 1063, 4479
Climate—*see also* Frost, Hail, Sun, *and individual plants under* climate—
  artificial, growing plants in, 1137, 3444n
  cyclic variations, crops affected by, 2344
  dew—
    deposition on plants, 2192
    gradients, 3288

Climate—dew (*continued*)—
    measurement, 2191
  insolation injury to trees, 2417
  micro-, of fruit trees and bushes, 1145m, 1272, 2417
  micro-, of tomato, 1145m
  plant diseases and, 2112
  rain, artificial stimulation of, 1081, 2190, 3423
  rain, excretion of leaf minerals by, 2181
  rainfall—
    crop yield relationships, 2195
    expectation, calculation of, 2189
    measurement of, 80a, 3434
  of the U.S.S.R., 4449
*Clitocybe tabescens*, 2461, 4340, 4341
*Clitoria ternatea*, 4062
Cloches, continuous, developments in, 1647e
Cloves—
  for cigarettes, 842
  diseases, 883-885, 3139
  growing in Zanzibar, 886, 4270
  nutrition, 1917
  oil, 882
  pests, 4311
  physiology, transpiration, 1970
  propagation by cuttings, 861
Clover control in lawns, 2585
Clubroot—*see Plasmodiophora brassicae*
*Clysia ambiguella*, 333, 2478
*Cnephasia longana*, 2498
Coal gas treatment for ripening fruits, 1931
Cob nut—*see under Corylus*
Cobalt—
  cell enlargement affected by, 2140
  contents of vegetables, 412
  in plant nutrition, 2812
  radioactive, 1095, 1096, 2226, 3452
*Coccomyces hiemalis*, 300, 2535, 4483
*Coccus hesperidum*, 796, 1813n
*Coccus pseudomagnoliarum*, 796
Cockchafer—*see also* White grub—control, 319, 372j, 2546d, 3641
Cocoa—*see* Cacao
Coconut—
  breeding and selection, 1971, 4313
  composition, shell, 900
  diseases—
    fungus, 1017e, 3148
    gumming, coreid bug causes, 3146, 3147
    nematode causes, 896, 897
    in Papua-New Guinea, 1973
    physiological or of unknown cause, 1974, 3145, 4314, 4317
    in Trinidad, 3313
  economics, 888
  flower drop, 894, 1971
  flowering, premature, 3269m
  growing—
    in British Guiana, 4268
    in East Africa, 3141
    in the Far East and South Pacific, 888, 2078p
    in French West Africa, 4312

Coconut—growing (*continued*)—
    mechanization of, 4316
    a review, 887
    in the Seychelles, 1016p
  growth, abnormal, 2078j, 3269 l, 3269m
  ladder for, 895
  nurseries, 890, 3143
  nut—*see also below*, seed—
    abnormalities, 3144, 4313, 4317
    milk (water), growth substance from, 3888
    milk (water) for tissue cultures, 3122
  nutrition—
    by injection, 4314
    nitrogen, 1972
    sugarcane factory wastes, 4447d
  oil—*see below*, products
  pests—
    caterpillars (*Brassolis* spp.), 3150
    caterpillars (*Nephantis serinopa*), 899, 1017g, 4318
    coccids, 1975
    coconut beetle (*Brontispa longissima*), 898
    coreid bugs (*Amblypelta* and *Theraptus* spp.), 883, 3141, 3146, 3147, 4320
    flying foxes, 4447c
    in India, 4318
    *Melittomma insulare*, 4319
    nematode, 896, 897
    rhinoceros beetles (*Oryctes* spp.), 898, 1017g, 1976, 3141, 3149, 4318
    squirrels, 839
    termites, 4321
    weevils (*Rhynchophorus* spp.), 896, 898, 1017g, 3313, 4318
    whitefly (*Aleurodicus destructor*), 898
  planting, 3142
  polyembryony, 891
  products—
    charcoal, 900, 1017t
    coir, 1971
    copra, 3269f, 3270q
    oil, 1050, 1675, 1977, 2100
    shell, 900
  research—
    in Ceylon, 833
    in French West Africa, 889, 927
    in India, 2108, 4476
    in Jamaica, 836
    in Malaya, 1915
  seed endosperm, 3269h
  seed, polyembryonic, 891
  soil—
    management—
      cover crops, green manures and grass, 1017h
      intercropping, 893, 4289
      watering of seedlings, 4315
    moisture relations, 892
    nitrogen under, 1972
  varieties, 4313
Codling moth (*Cydia pomonella*)—*see also* Apple pests—
  bait and light traps for, 1391
  biology in Israel, 372d

- Codling moth (*continued*)—
  - control, biological, 1424
  - control, chemical, 246, 329, 330, 1392, 1393, 1424, 2506, 2531, 3649
  - time of emergence and warning services, 2504, 2505
- *Coffea dewevrei* var. *excelsa*, 908
- Coffee—
  - beans—*see also below*, composition—abnormal, 1990
  - bibliographies, 901, 912, 1978
  - Board of India, A.R., 3152
  - Board of Kenya, A.R., 4446u
  - breeding and selection, 2078o, 2078x, 3154, 4324, 4327
  - by-products (husks and pulp), 4469
  - climate, cold injury, 4337
  - composition—
    - bean, 920, 921, 1017a, 4336
    - leaf, 906, 4331
    - root, 4330
  - diseases—
    - cause uncertain, virus-like symptoms, 4338
    - fungus—
      - berry disease (*Colletotrichum coffeanum*), 3303
      - black rot, koleroga or thread blight (*Pellicularia* (*Corticium*) *koleroga*), 1992, 4339
      - canker and wilt (*Ophiostoma coffeae*), 1993
      - leaf spot (*Omphalia flavida*), 914, 2151, 3166
      - pink disease (*Corticium salmonicolor*), 4342
      - root diseases (various organisms), 4340, 4341
      - rust (*Hemileia vastatrix*), 912, 913, 1994, 4323
      - stem canker (*Ceratostomella fimbriata*), 911, 3168
      - tracheomycosis (*Gibberella* (*Fusarium*) *xylarioides*), 1995, 4343
    - non-parasitic, 4447t
  - fruiting, biennial, 4330
  - growing in—
    - Angola, 3299
    - Brazil, 902, 2079d
    - British Guiana, 4268
    - Ceylon, 4323
    - East Africa, 4323
    - the Far East, 4323
    - French West Africa, 4325
    - Hawaii, 4323
    - India, 4323, 4446f
    - New Caledonia, 3165
    - the Philippines, 4323
    - St. Vincent, 4447i
  - growth, branch dimorphism, 909
  - herbicide injury, 1478
  - leaf, stomatal movements, 3153
  - moss removal, 1991
  - nurseries, 1979, 2079d, 4326
- Coffee (*continued*)—
  - nutrition—
    - boron, 1988
    - calcium, 1988
    - iron, 908
    - foliar diagnosis for, 4331
    - manganese, 1988
    - manuring—*see also below*, soil management—905, 906, 1917, 1988, 2078r, 3161, 4324, 4331
    - mineral deficiencies, 1989, 4447t
    - zinc, 1988, 3270c
  - pests—
    - ants (several species), 1996, 1997, 3303
    - berry borer (*Stephanoderes hampei*), 3676, 4344
    - *Dichocrocis crocodora*, 3676
    - green bug (*Lecanium viride*), 1998
    - *Habrochila placida*, 3169
    - leaf miners (*Leucoptera* or *Perileucoptera* spp.), 915, 1999
    - loopers (*Biston* and *Elphos* spp.), 3270h
    - mealybugs (*Pseudococcus* and other spp.), 916, 1997, 3303, 4345
    - mite (*Hemitarsonemus latus*), 917
    - snail, 918
  - physiology—
    - light responses, 1985, 3153
    - metabolism, 4330
    - a review, 4447s
  - planting—
    - hedge system, 4329
    - methods, 3157, 4326
    - spacing, 1984, 3160, 4327
  - processing—
    - berry cleaning, chemical methods, 2000, 3164
    - drying, 4335
    - factory for, 3163
    - fermenting and washing, 919, 4334
    - micro-organisms, 3269e
  - production and trade, 1016y, 1914, 3151, 4322
  - propagation by cuttings, 1980, 1981, 3156, 4327
  - propagation by grafting, 1982, 4328
  - pruning, 910, 1017p, 1983, 1984, 3162, 4324, 4329, 4340
  - research—
    - in Australia, 2109
    - in the Belgian Congo, 834
    - in East Africa, 4446r
    - exp. Stat., Lyamungu, Moshi, A.R., 4324
    - in India, 3152
    - in Indo-China, 1045
    - in Indonesia, 4272
    - in Jamaica, 836
    - in Kenya, 3303
    - in Madagascar, 4273
  - root composition, 4330
  - rootstocks, 908
  - shade—
    - light distribution under, 1986
    - requirements, 3159

- Coffee—shade (*continued*)—
    - trees (and other plants), 1987, 4327, 4329, 4333, 4340, 4341
  - soil—
    - conservation, 3158
    - indicators, seedlings as, 907
    - management—*see also above*, nutrition—
      - cover crops and green manuring, 4329, 4332
      - mulching, 594, 1917, 3303, 4329
      - weed control, 1478, 3303, 3749
  - tree poisoning and grubbing, 4340
  - varieties—
    - in Brazil, 2078g
    - in Costa Rica, 903
    - seedling, 904, 4325
  - yields in India, 3155
- Cohune palm (*Attalea cohune*), 4464
- Coir—*see* Coconut products
- *Colaspis quattuordecimcostata*, 3639
- Colchicine—
  - treatment of—
    - apple, 2228
    - asparagus, 4472
    - brassicas, 4472
    - castor bean, 613
    - delphinium, 4472
    - fruits, deciduous, 4472
    - kok-saghyz, 1742o
    - papaw, 1017o
    - tobacco, 3966
- *Colchicum* spp. in the Near East, 2957
- Colemanite, a source of boron, 2180
- Coleoptera, a book on injurious, 3272
- *Coleus*—
  - diseases, 2151
  - growth, 33
  - growth substances in, 79n, 2157
- *Colladonus*—
  - *geminatus*, 2432, 3597, 3598, 3689r, 3689s
  - *montanus*, 3689r
  - spp. as virus vectors, 1330, 2432, 3689s
- Collections, variety—*see* Variety
- *Colletotrichum*—
  - *atramentarium*, 528
  - *coffeanum*, 3303
  - *falcatum*—*see Physalospora tucumanensis*
  - *ficus*, 958
  - *gloeosporioides*, 793, 1860
  - *lindemuthianum*, 471
  - sp. on cacao, 3131
  - sp. on papaw, 940
- Colombia—
  - cacao growing and research, 1935, 3119-3121, 3131, 3138, 3311, 4287
  - coffee growing, 2078o
  - sugarcane growing, 2041
- Colour—*see also* Pigments—in fruit, changes of, 2011
- Colour measurement, apparatus for, 542i
- Commonwealth Agricultural Bureaux, 2099
- Commonwealth Bureau of Horticulture, 79a
- Comoro Islands, fruit growing, 4271
- Compositae, anatomy, 2179
- Compost—*see also* Mushroom—
  - cacao waste, 4308
  - krilium no substitute for peat, 54
  - mango seed, 4447h
  - parasitic organisms in, 423
  - potting, 4102
  - preparation, machines for, 76, 3436
  - town waste, 1047, 3821
  - vine shoot, 1282, 2096
- Condiment plants—*see also separate species*—of American deserts, 2868
- Conifers—
  - atomic radiation injures, 2994
  - diseases, 2995, 2996
  - growing in Argentina, 735y
  - juvenile forms, 1090
  - propagation by grafting, 704
  - pruning, 3011l
- *Coniothyrium* (*Coniella*) *diplodiella*, 2479
- *Conium maculatum*, 3711
- *Conotrachelus cristatus*, 1521
- *Conotrachelus nenuphar*, 372y, 1396, 3634
- *Contarinia pisi*, 3854
- Contour—*see* Planting
- *Copernicia cerifera*, 3278
- Copper—
  - arsenate, fruit maturity hastened by, 3049
  - determination, 11, 2209c, 3259, 3679
  - fungicides—*see* Fungicides
  - latex in hevea affected by, 1017x
  - metabolism in plants, 79t
  - nutrition—
    - of apple, 254, 2400
    - ascorbic acid oxidase an index of, 41
    - of bean, 41, 466
    - of citrus, 774, 777, 1838, 1839, 4196, 4198-4200
    - of fruit crops, 4453
    - of gladiolus, 3301
    - of hevea—*see above*, latex
    - of pea, 466
    - of pear, 254, 2400
    - of tobacco, 41, 3998
    - of tomato, 41, 1634
    - of tung, 3097
  - sulphate as a herbicide, 3759o
  - toxicity, 774, 1502, 3301, 4198-4200
- Copra—*see* Coconut products
- *Corchorus olitorius*, 4068f
- *Cordana musae*, 2893
- *Cordia* sp. as shade for coffee, 4333
- *Cordia superba*, nutrition, 4274
- *Cordyline terminalis*, 4101
- *Coreopsis* flower pigments, 4162x
- Coriander growing in the U.S.S.R., 2887
- Cork tissues in plants, 2208v
- *Cornus florida*, 3011f
- *Cornus* sp., propagation by cuttings, 1796
- *Corticium*—
  - *koleroga*—*see Pellicularia koleroga*
  - *salmonicolor*, 4342, 4361
  - *solani*, 735u, 1514, 1536, 2468, 2944, 3419, 4361
  - sp. on lawn grasses, 2975

*Corylus* (hazel, cob nut and filbert)—
  climate, frost resistance, 1289
  diseases, fungus, 1366
  fruiting, irregular, 3572f
  nutrition, 1057
  photosynthesis, 2208 l
  pollen composition, 3572o
  pollination, 1288, 1289
  propagation, 4472
  seed oil, 1295c
*Corynebacterium michiganense*, 520, 1513, 2443, 2815, 2822, 3783, 3937
*Cosmopolites sordidus*, 1927, 1928, 3270m
Cosmos flower malformations, 1813e
Cosmos flower pigments, 4162x
Cost—*see* Economics
Costa Rica—
  cacao growing and research, 1940
  coffee growing, 903
  pineapple growing, 2012
  onion growing, 542u
Cotoneaster, seed germination, 703, 2997
Cotyledons, function in germination, 3461
Couch grass—*see Agropyron* spp. *and Cynodon dactylon*
Coumarin from *Coumarouna* spp., 580
Coumarin, a growth inhibiting substance, 37
Cover crop(s)—
  for apples, 156, 341, 1204, 3510
  for bananas, 848
  for cherries, 1205
  for citrus, 763, 1832, 3018, 3029, 3030, 4190
  for coffee, 3303, 4329, 4332
  for deciduous fruit trees, 158, 1203, 2278, 2279
  for green manuring, 1572, 1661, 1832, 2078t, 3029, 3030, 4332
  in Hawaii, 2077
  for oil palms, 3175
  for peaches, 159, 1206, 2280, 3511
  for pears, 147
  plant(s)—
    *Cajanus* spp., 1015, 4329
    *Canavalia ensiformis*, 4332
    clover, subterranean, 2279
    collections of, 3102
    *Crotalaria* spp., 1015, 1017h, 3263, 4329, 4332, 4447v
    *Desmodium* spp., 1015, 4329
    *Glycine javanica*, 3018
    grass and clover swards, 1204, 1205, 2278, 3510, 3511
    lucerne (*Medicago sativa*), 3030
    *Phaseolus lathyroides*, 1015
    *Polygonum convolvulus*, 341
    *Sesbania speciosa*, 1015
    *Stizolobium aterrimum*, 1015
    *Stylosanthes gracilis*, 1015
    *Tephrosia* spp., 1015, 3269j, 3269p
    *Tithonia* sp., 1916, 2067
    *Trifolium alexandrinum*, 3030
    *Trigonella foenum-graecum*, 3030
    velvet bean, 2078t
  for tea, 3263, 3269j, 3269p
Cover crop(s) (*continued*)—
  for vines, 2279
Crabgrass (*Digitaria* spp.) and its control, 2586-2588, 3721
Cranberry—
  nutrition, 4453
  packing, 2395 l
  varieties, 202
*Crataegomespilus asnieresii*, 3335
*Crataegus*—
  *oxyacantha*, 258
  spp., control of undesirable, 2576, 3734, 3735
  spp. as food plants, 2322e
Creosote bush (*Larrea divaricata*), 2868
*Crinum* spp., velamen cells in roots, 658
*Crocus* composition, stigmas, 581
*Cromaphis juglandicola*, 2493, 2494, 3637, 3638
*Cronartium ribicola*, 1350, 3732
*Crotalaria*—
  *anagyroides*, 3263
  *grahamiana*, 4447v
  *incana*, 615a
  *juncea*, 4322
  *spectabilis*, 1015
  *striata*, 1017h
  *usaramoensis*, 615a
*Croton mubango*, 4327
*Croton* varieties, 4162f
Crown gall (*Bacterium tumefaciens*)—
  bioelectric potentials affected by, 80h
  of *Bryophyllum* spp., 35
  of blackberry and boysenberry, 3603
  control, 3937
  of *Kalanchoë* sp., 35
  of pecan, 2481
  reviews on, 35, 3333
  of rose, 700
  of sunflower, 3937
  of tobacco, 1697c
  of tomato, 35, 80h, 521, 3937
Crucifers, diseases, 3897
Crucifers, pests, 2838s
*Cryptophasa unipunctata*, 327
*Cryptosporella eugeniae*, 883-885
*Ctenomys* sp., a rodent attacking citrus, 1882
Cuba—
  banana growing, 2078q
  ramie growing, 4037
  sugarcane growing and research, 3197, 3207
Cucumber and gherkin—*see also* Cucurbits—
  antibiotics, uptake and translocation by, 1555
  climatic requirements, 3294
  composition, 1551
  diseases—
    bacterial, 2443
    fungus, 449, 450, 452, 455, 1553, 1554, 3419, 3829, 3830
    iodine treatment for, 2182
    virus, 3689c, 3950, 3952, 3955 l
  flower biology, 3955q
  flower development, carbon monoxide stimulates, 3426
  fruit grading, 1058

- Cucumber and gherkin (*continued*)—
  - growing in South Africa, 542n
  - growth, insecticides affect, 3831
  - growth substances in, 79n
  - hybrid vigour, 1550
  - labour requirements, 1489
  - light, supplementary, for, 3430, 3827, 4480
  - nutrition—
    - carbon dioxide, 1504, 3426
    - foliar, 3827
    - manuring, 196, 445, 2670, 2671
  - pests—
    - insect, 454, 1056, 1552, 3787, 3838
    - mite, 455, 2670, 3830
    - nematode, 2647, 2648, 2829
  - physiology and metabolism, 3955q
  - pollination, 448
  - propagation by grafting, 1647t, 3829
  - ringing, 2675
  - seed treatment, 3371
  - seedling production, 2672, 3772
  - sex expression, 2667
  - soil—
    - management—
      - irrigation, 447, 1506, 2638
      - mulching, 2800, 3774, 3775
      - sterilization, 445
      - weed control, 2612, 2613
    - requirements, 3304
    - temperature, compost raises, 446
  - soilless culture, 3828
  - spacing, 2669
  - sugar solution treatment, 3827
  - varieties, cucumber, 2113, 2668
  - varieties, gherkin, 3825, 3826
  - wind protection, 1500
- *Cucurbita ficifolia*, 3829
- *Cucurbita moschata*, 2673
- Cucurbits—*see also individual crops*—
  - diseases—
    - fungus, 451
    - resistance to, 1509
    - in the U.S.A., 1647j
  - hybrid vigour, 3763
  - pests, 3839, 3840
  - seed endosperm, 1647f, 2838d
  - wild, uses of, 2668
- Cultivar, definition, 3349
- Cultivators—*see under* Machines
- Cunene Exp. Stat., Angola, Rep., 3299
- *Cupressus macrocarpa*, 2996
- *Cupressus* spp. as windbreaks, 1853
- *Curculio* spp. on chestnut, 1383
- Currant—*see* Black *and* Red currant *and* Vine fruit, dried
- *Curvularia lunata*, 669
- *Cuscuta* spp.—*see* Dodder
- Custard apple (*Annona cherimola*)—*see* Cherimoya
- Custard apple (*Annona squamosa*), 3264
- Cuttings—*see also* Growth substances—
  - *Acer palmatum*, 711
  - adenine an aid in rooting, 1172, 3463
  - *Annona* spp., 4440
  - apple, 1236n, 3462
  - avocado, 736, 738, 3014
  - azalea, 728, 729, 1796
  - breadfruit, 4267
  - cabbage, 3800
  - cacao, 859, 861, 1945, 3218, 4290, 4291, 4293
  - camellia, 1800, 4070, 4147
  - carnation, 627, 628, 2935, 4070, 4082
  - cherry, 1172
  - chestnut, 240
  - chrysanthemum, 2927, 4070, 4087
  - cinchona, 4309
  - citrus, 760
  - clove, 861
  - coffee, 1980, 1981, 3156, 4327
  - *Cornus* spp., 1796
  - *Duboisia* spp., 1713
  - fig and other *Ficus* spp., 3464, 4151
  - fumigation, 4147
  - fungicide treatment, 3078, 3672, 4327
  - geranium, 3672
  - gerbera, 4093
  - guava, 4346
  - hevea, 2025
  - holly, 718
  - hop, 4046
  - horse-radish, 1091
  - hot water treatment, 4046
  - leaf blade, 4071
  - lime (*Tilia* spp.), 3304
  - *Lonicera* spp., 1796
  - macadamia, 1891
  - mist spray humidification for, 705, 1795, 1796, 1800, 2926, 2927, 3078, 4346
  - mulberry, 1173
  - olive, 3078, 3079
  - ornamental plants, various, 618, 705, 1795, 1799
  - peach, 3463
  - pear, 1236n
  - peperomia, 2944
  - *Physalis* spp., 3542
  - pineapple, 943
  - plastic covers to protect, 2204, 2206, 2925, 4162o
  - plum and other *Prunus* spp., 1172, 1796, 3463
  - raspberry, 206, 1240
  - *Rauwolfia serpentina*, 4012
  - rhododendron, 727, 730, 731, 735d, 4157, 4490
  - root, factors affecting regeneration, 206, 1091, 1240
  - rose, 1787, 2927, 4070, 4132
  - spruce (*Picea* spp.), 1812
  - stem rot prevention, 4070
  - storage, 628, 4082, 4087
  - tea, 1003
  - *Thuja* spp., 1796
  - tobacco, 1657, 3988
  - tomato, 3920
  - vermiculite as a rooting medium, 4069, 4070
  - vine—*see* Vine propagation
- Cutworm control, 2511, 2655, 4229

Cyclamen—
  diseases, 660, 1769, 4103
  growing in Belgium, 2958
  potting composts, 4102
  seed germination, 659, 2959
  varieties, 3011m
*Cycloconium oleaginum*, 3084, 3085
*Cydia molesta—see* Fruit moth, oriental
*Cydia pomonella—see* Codling moth
*Cylindrophora albedinis*, 807
*Cylindrosporium padi*, 1348
*Cylindrosporium pisi*, 1578
*Cymbidium* orchids, soil mixtures for, 4125
*Cymbopogon* spp. yielding citronella and other aromatic oils, 2885, 2886
*Cynara scolymus—see* Artichoke, globe
*Cynodon dactylon*, 3199, 3718, 3743
*Cynodon* spp., as lawn grasses, 1780, 2972
*Cyperus* spp., control, 385, 386, 1456-1461, 2565-2567, 3722, 3723, 3743, 3746, 3750
*Cyphomandra betaceae—see* Tree tomato
*Cypripedium* spp. flowering, annual fluctuations in, 4162e
Cyprus Dep. Agric., A.R., 1653, 2098
Cyprus, tobacco research, 1653
*Cytisus praecox*, laburnum a rootstock for, 3004
Czechoslovakia, vine growing, 2395a

*Dactylium dendroides*, 2739
*Dacus*—
  *cucurbitae*, 454, 3838, 4276
  *diversus*, 3840
  *dorsalis*, 454, 1056, 4276, 4465
  *oleae*, 323, 823-825, 832h, 1905, 2531, 3087, 3088, 4258-4260
  *tryoni*, 382, 1387
Daffodil—*see* Bulbs *and* Narcissus
Dahlia—
  diseases, 662, 2960
  flower—
    malformation, 1813e
    pigments, 661, 4162x
    production, growth substance enhances, 3922
  grafting for virus detection, 1743
  pests, nematode, 662
  research in Belgium, 618
  varieties, 1743, 3011j, 3011m
Daisy, shasta, photoperiodic response, 2931
Damping-off—*see also Corticium*, *Pythium and other relevant genera*—
  in brassicas, 1514, 1536
  in cabbage, 3419
  in camellia, 1800
  in cauliflower, 3419
  in celery, 1547
  control with iodine, 2643
  in cucumber, 3419
  in lawns, 735u
  peat reduces, 3419
  in tobacco, 1683, 1697o
Damson pests, 1434
Dandelion control, 3281
Danish—*see under* Denmark
*Daphne mezereum*, 715
*Dasyneura*—
  *affinis*, 1766, 2954
  *mali*, 3645
  *oleae*, 826, 3089
  *pyri*, 2491
  spp. in Holland, 4077
  *tetensi*, 2491, 2502
Date—*see also Phoenix*—
  composition, fruit, 806
  diseases, 807
  growing and marketing in Pakistan, 4250
  palm distribution in North Africa, 3100h
  pests, fruit beetles (*Carpophilus* and other spp.), 808
  research in North Africa, 2096
  seed treatment, 1795
  varieties, 806
*Datura*—
  *inermis*, 2874
  *innoxia*, 615f
  *metel*, 1712
  spp., alkaloid contents, 1712
  spp., intergeneric grafts, 1708
  *stramonium*—
    diseases, 4008
    embryo culture, 48, 4010, 4011
    growing in the Philippines, 582
*Decticus albifrons*, 3660
Deer control and repellents, 2546m
Deficiencies, mineral—*see also* Minor elements *and under individual elements*—
  in Australia, 1508
  a book on, 3292
  in cacao, 867, 868
  in carnation, 735n
  in chrysanthemum, 2940
  in coconut, 4314
  diagnosis of, 867-869, 1951, 3778
  in fruit crops, 250, 2401, 3577, 3778, 4453
  in hevea, 957, 3192
  injections to cure, 4314
  in oil palms, 2005
  and soil pH, 1121
  in strawberry, 3778
  in sugarcane, 4379
  in vegetables, 3778
Defoliation of fruit trees, growth substance delays, 1201
Defoliation with chemicals, 1813k, 2981, 2998, 3005
Dehydration—*see* Drying
Delhi Domin. exp. Stat., Ont., Rep., 3958
*Delia antiqua*, 1544, 1600, 3956d
*Delia cilicrura*, 1583, 1600, 1647i
Delphinium—
  breeding, 4472
  pests, nematode, 1759
  spp., taxonomy, 4162n
  varieties, 1743
*Dendrophoma obscurans*, 304
Denmark—
  blueberry growing, 203

Denmark (*continued*)—
  hort. Soc., Yearbook, 3276
  horticulture and horticultural research, 2208c, 3280
  Inst. Weed Res., A.R., 404e
  mushroom growing, 2717
  Seed Path. Service, A.R., 1061f
  Seed Testing Stat., A.R., 1061g, 3323d
  vegetable growing, 4457
*Depressaria nervosa*, 1699
*Dentatus communis—see Anuraphis devecta*
Derris—*see also* Insecticides—composition, sapogenins, 4006
Desert(s)—
  flora, 2868
  ornamental trees for, 4137
  research, 3288
*Desmodium ovalifolium*, 4329
*Desmodium uncinatum*, 1015
*Deuterophoma tracheiphila*, 792, 1861, 3055, 4224, 4225
Dew—*see* Climate
*Diabrotica* sp. on melons, 456
*Diaporthe citri*, 789, 793, 1862, 3073
*Diaprepes abbreviatus*, 4411, 4447u, 4447z, 4461
*Diarthronomyia hypogaea*, 2942
*Diaspis bromeliae*, 2018
*Diaspis pentagona*, 345, 1435o
Diatomaceous dust, insecticidal action of, 2705
*Diatraea* spp. on sugarcane, 987, 991, 992, 994, 3239, 3240, 4410, 4414-4416, 4447u, 4461
*Dichocrocis crocodora*, 3676
*Dichrostachys nutans*, 2578
*Dicksonia* sp. in New Zealand, 4160
*Dicranostigma lactucoides* and *D. franchetianum*, 2876
*Dictamnus albus*, 2888
*Didacus ciliatus*, 3300
*Didymella lycopersici*, 522, 523, 2105, 3940
*Didymocladium ternatum*, 2739
*Digitalis* spp.—
  diseases, 4008
  gigas forms, 3357
  seed treatment, 1057
*Digitaria* spp.—*see* Crabgrass
*Dindymus versicolor*, 2497
*Diospyros*—*see also* Persimmon—*lotus*, 258
*Diplocarpon rosae*, 4134
*Diplodia natalensis*, 789, 793, 1887, 1888, 3054, 3073
*Diplodina persicae*, 2462
*Dipsacus laciniatus*, 1742r
Diptera, a book on, 2082
Disease(s)—*see also* Virus *and pathogens and hosts*—
  control—
    by acidic buffer sprays, 2821
    by antibiotics—*see* Antibiotics
    biological, 4434
    ecological, 1511
    by soil acidification, 3008
    by ultra-violet irradiation, 3614
  detection by wilting method, 3373
Disease(s) (*continued*)—
  of flowers, 4076
  forecasting, 249
  of fruit plants, 3291
  identification, 1296, 2398
  incidence and climate, 2112
  investigations, statistical methods for, 372f, 1960, 2131
  mildew, a review, 3604
  nutritional, a book on, 3292
  of ornamental plants, 3291, 4162t
  in Peru, 3575
  resistance, factors affecting, 1298, 1641, 2826, 3942, 3982, 3986
  resistance in vegetables, 1509
  rust, a review, 3604
  seed-borne, 2698, 2838n
  in South Africa, 245
  in the Sudan, 1033
  in the U.S.A., 1376, 2397, 3291
  of vegetables, 542c
*Distantiella theobroma*, 879, 1962
*Ditylenchus*—
  *dipsaci*, 648, 1370, 1435m, 2838r, 2921
  spp.—
    on hydrangea, 3001
    on mushroom, 474, 2740, 2741
    on phlox, 649
*Dizygomyca cepae*, 2838t
*Dociostaurus maroccanus*, 3660
Dock (*Rumex* spp.) control, 3724
Dodder (*Cuscuta* spp.)—
  composition, 1742s
  seed identification, 3759d
  virus transmission by, 4090
Dogwood, flowering (*Cornus florida*), 3011f
*Dolichotetranychus floridanus*, 2018
Dominica Dep. Agric. For., A.R., 3323e, 4494c
*Doralis pomi*, 2518
Dormancy—*see also* Growth substances, dormancy, *and individual plants*—
  breaking—
    in deciduous fruit trees, 139, 2216
    in gladiolus, 667
    in woody plants, 707, 716
  induced in citrus, 1850
  intensity related to flower bud development, 140
  prolonged, in deciduous fruit trees, 4453
  a review, 79h, 3365
  seed—*see* Seed
*Dothidella ulei*, 2027, 3270r, 4361
*Dothiorella gregaria—see Botryosphaeria ribis*
*Dovyalis abyssinica*, 4264x
*Dracaena sanderiana*, 1802
*Draeculacephala portola*, 4410
Dragonfly, as pest of persimmon, 3100n
Drainage ditches, frost protection by, 264
*Drosophila* spp. on tomato, 2831
Drought—
  physiological effects of, 3860
  responses of—
    apple, 3577
    blueberry, 2428, 2545h

Drought—responses of (*continued*)—
      pear, 2251
      plum, 266
      sugar cane, 4447y
Drug plants—*see* Medicinal plants
Drying—
   apricots, 1235, 3525
   barbecue for copra, 3269f
   figs, 1235
   fruits, 3535
   grapes, 1235
   kiln for cacao, 1932
   pineapples, 4446m
   tobacco—*see* Tobacco curing
   vegetables, 2630
*Drymaeus dormani*, 4241
*Duboisia* spp., propagation, 1713
Durian growing in India, 2078a
Duster, power-operated, 1880
Dusts—*see under* Acaricides, Fungicides *and* Insecticides
Dutch lights—*see* Frames
Dwarfing trees, methods of, 1792
*Dyspessa ulula*, 483

Earhart Plant Res. Lab., Calif., 3444n
East—
   Africa—*see* Africa, East
   African Agric. For. Res. Organ., A.R., 3323f
   Malling Res. Stat.—
      A.R., 4468
      soil survey, 3443f
      work at, 3539u, 3539v
Ecology of tropical tree crops, 840
Economic(s)—*see also* Labour *and* Trade—
   apple, 201g, 2218
   citrus, 754, 4181
   frost protection, 1851
   fruit growing, 84, 85
   geography of the U.S.S.R., a book on, 4449
   hevea, 4447b
   irrigation, 2198
   oil palm, 932
   olive, 822
   sugar cane, 3226, 4364
   vegetables, 2628
   vine, 1264
Ecuador, cacao growing, 3131
Ecuador, economic plants, 1079
Efford exp. Hort. Stat., 4479
Eggplant (*Solanum melongena*)—
   breeding, 3763
   diseases—
      bacterial, 1512
      fungus, 3948
      market, 514
      resistance, 1509
      virus, 3950
   fruit set and development, growth substances affect, 2834, 3922
   growing in New Zealand, 406
   pests, 1521
   rootstock, *Solanum torvum*, 3947
   varieties, 3763, 4480
Egypt—
   banana growing, 2078k
   citrus growing, 832b, 3100g
   subtropical fruit growing, 4264j
   sugar cane growing, 4447w
*Elaeagnus angustifolia*, 2412
*Elaeis* (mainly *E. guineensis*—oil palms)—
   breeding and selection, 928, 929, 2004, 3269n
   bunch characters, 2004
   composition, leaf, 934, 935, 2005, 3177, 4351
   diseases, non-parasitic, 928, 938, 3178, 4352
   diseases in West Africa, 937
   economics of establishment, 932
   growing in the Cameroons, 2119b
   growth and yield correlations, 2004
   nursery management, 930, 3176
   nutrition—
      leaf analysis for—*see above*, composition
      manuring, 3175
      mineral deficiencies, 934, 935, 2005
      minor elements, 4352
   palm oil—
      composition, 1050, 3179
      content, determination of, 2004
      extraction, 2006
      trade, 2100
   pests, 933
   planting, 933, 3175, 3176
   pollination, 936
   research—
      in the Belgian Congo, 834
      in French West Africa, 927
      in Jamaica, 836
      in Malaya, 1915
      a review, 4350
      at West African Inst. Oil Palm Res., 926, 3174
   seed germination, 931, 3176
   seed pericarp, 1017v
   selection—*see above*, breeding
   soil management, cover cropping, 3175
   soil studies, 4269
   viviparous, 1016t
*Elasmopalpus lignosellus*, 2709, 4410
Elderberry—
   pigments, 2168
   research at Kentville, 202
   wine, 4446z
Electric(al)—
   conductivity of tree branches, 778
   current for insect control—*see also* Electromagnetic *and* Electronic—1080
   heating, soil, 66
   potentials, crown gall affects, 80h
Electricity, horticultural uses of, 3321
Electromagnetic insect control, 2967
Electronic insect control, 3334
*Elphos hymenaria*, 3270h
*Elsinoë ampelina*, 305, 372p
*Elsinoë fawcetti*, 1862, 1863
*Emblica officinalis*—*see Phyllanthus emblica*
Embryo culture, 48, 109, 2172, 2258, 3461, 4010, 4011, 4472
*Emmalocera depressella*, 993

*Emphytus cinctus*, 2545b
*Empire and Commonwealth Year Book*, 1051
*Empoasca* spp. as pests, 1715
*Enarmonia nigricana*, 3853
Endive—
  breeding, 3764
  ×chicory hybrids, 543h
  nutrition, 50
  vernalization, 4480
*Endomyces hylocoeti*, 1379
Endosperm haustoria in cucurbits, 2838d
Endosperm role in seed germination, 3459
*Endothia parasitica*, 1364
England—*see under* Great Britain
*Entada phaseoloides*, 4062
*Entandrophragma* spp., tannin from, 4065
*Entomosporium maculatum*, 3611
*Entyloma dahliae*, 662
Enzyme(s)—
  activity—
    and growth substances, 3384, 3385
    nutrition of plant affects, 2849, 3443x
    in ripening fruits and seeds, 1846, 2307
  anhydrase, carbonic, 17
  ascorbic acid relationships, 17
  bromelin, 946
  browning of fruit due to, 1216
  of cacao tissue, 869
  carbohydrase, 3444g
  catalase, 41, 3125
  cell growth related to, 2145
  coenzyme A, 2144
  distribution in plants, 3395
  estimation in plants, 3394
  in fruit trees, 3515
  oxidases, 17, 41, 3395
  pectic, 525
  peroxidase, 2303
  phenolase, 2302
  phosphatases, 508, 3928
  ribonuclease, 1742b
  in tobacco leaf, 577c
Eosine, plant response to, 1112
*Ephestia kühniella*, 2521
*Ephidiaspis leperii*, 345
*Epilachna chrysomelina*, 3839
*Epilachna varivestis*, 2707
*Epipolaeus caliginosus*, 4046
*Epitetranychus althaeae*, 314
*Epitrix cucumeris*, 1645
*Epitrix hirtipennis*, 3992
*Eremochloa ophiuroides*, 1780
*Erica carnea*, 2995
*Eriobotrya japonica*—*see* Loquat
*Erioischia brassicae*, 438, 439, 1537, 1542-1544, 2665, 3815, 3816, 3899, 3900, 3955o
*Eriophyes*—*see also Phytoptus*—*phloeocoptes*, 3690g
*Eriophyes similis*, 1373, 2491
*Eriosoma lanigerum*, 2518, 3632, 3690b
*Eruca sativa*, 3358
*Erwinia*—
  *amylovora*, 280, 372l, 2441-2446, 3689p
*Erwinia* (*continued*)—
  *carotovora*, 488, 1536
  *chrysanthemi*, 647, 4091
  *vitivora*, 1335
Erysiphales, plant diseases caused by, a review, 3604
*Erysiphe cichoracearum*, 450, 570, 571, 1678, 3830
*Erysiphe polygoni*, 2678
*Erythrina lithosperma*, 1987
*Erythrina poeppigiana*, 3131
*Erythroneura variabilis*, 3659
Essential oil(s)—*see also individual oil bearing species*—
  analysis, 615i
  angelica (*Archangelica* sp.), 4020
  *Anthocephalus cadamba*, 2881
  bay, 1742n
  bellary (*Litsea* sp.), 615n
  camphor—*see* Camphor
  cassia (*Acacia* sp.), 2922a
  *Cestrum nocturnum*, 2881
  citronella—*see Cymbopogon*
  citrus—*see* Citrus products
  content, estimation of, 1742e, 4016, 4017, 4020
  content, factors affecting, 4021
  coriander, 2887
  dictamnus, 2888
  dill (*Anethum graveolens*), 4021
  distillation, 2879, 4017
  eugenol (clove), 882
  exports, British Commonwealth, 4068b
  geranium (*Pelargonium* spp.), 836, 4019
  guava, 2078e, 2078f
  *Haplopappus laricifolius*, 615g
  lavender, 4022
  lemon grass—*see Cymbopogon*
  lime—*see* Citrus products
  *Metrosideros umbellata*, 1742f
  *Mimusops elengi*, 2881
  mint—*see* Mint
  muhuhu, 1050
  nutmeg leaf, 592
  *Nyctanthes arboristes*, 2881
  orange—*see* Citrus products
  peppermint—*see* Mint
  plants—
    in India, 4015
    in Pakistan, 2880
    in the U.S.A., 2868
  production in Réunion, 4446v
  review on, 591
  rose, 4016-4018
  sage, 2891
  sandalwood, 1050
  *Schizandra chinensis*, 2871
  stills, 2879
  synthesis, 2889
  spearmint—*see* Mint
  tarragon, 2883
  from umbelliferous plants and fruits, 4021
Ethylene—
  chlorhydrin for dormancy breaking, 139

- Ethylene (*continued*)—
  - emission—
    - by detached leaves, 2141
    - by fruits, 3518, 3524
    - by higher plants, 24
  - injury to plants, 804
  - treatment for ripening fruits, nuts or vegetables, 1931, 2832, 3522, 3539j
- *Eucalyptus*—
  - *delegatensis*, 2875
  - *forrestiana*, 735i
  - *intertexta*, 735h
  - spp., destruction of, 3730
  - spp., mistletoe control, 1462
- *Eucommia* spp. composition, 4055
- *Eucommia* spp., guttapercha from, 1733
- *Eugenia jambolana*, 3140
- *Euglyphis fibra*, 1818
- *Eulecanium corni*, 1434
- *Eumerus* spp. on onion, 1600
- *Eumyrmococcus* sp. on coffee, 4345
- *Euonymus rotundifolia*, 4141
- *Euonymus* spp., pests, 1803
- *Eupatorium glandulosum*, 3697
- *Euphorbia*—
  - *esula* control, 3709, 4465
  - *pulcherrima*—*see* Poinsettia
  - spp., pests, 4162q
  - *supina* control, 1471
- *Euproctis chrysorrhoea*, 3646, 3647
- *Euproctis fraterna*, 3140
- *Eupterix* spp. as pests, 1715
- Evapotranspiration—*see* Transpiration
- *Exobasidium vexans*—*see under* Tea diseases
- Experimental design—*see* Statistical
- Explosives in orchards and vineyards, 1280, 2095
- Exports—*see* Trade

- *Fabraea maculata*, 3611
- Fasciation, a review, 22
- Fats, production and trade, 2100
- Fatty substances in fruit trees, 3515
- Feijoa fruit respiration, 3518
- Feijoa growing in New Zealand, 1047
- Fencing posts, 3440, 3441
- Ferns, pests, 648
- Ferns, tree-, of New Zealand, 4160
- *Feronia elephantum*, 4476
- Fertilizer(s)—*see also* Manuring *and separate crops*—
  - application in irrigation water, 59, 3317
  - drills, 2079i
  - insecticides applied with, 1435g
  - liquid, 152, 2130
  - a manual on, 3290
  - placement for—
    - castor bean, 2912
    - citrus, 832i
    - sugar cane, 4376
    - tobacco, 4489
    - vegetables, 413, 2690, 2692, 4485
  - trials, analysis of, 3345, 3346
- *Festuca elatior* var. *arundinacea*, 1780
- Fibre—
  - determination in sugar cane, 2079 l
  - extraction, 596, 601, 4068c, 4068d
  - plants—
    - *Abroma augusta*, 598, 599, 834, 3104
    - *Agave sisalana*—*see* Sisal
    - *Agave* spp. in the Belgian Congo, 598
    - *Althaea officinalis*, 4068r
    - *Asclepias syriaca*, 4068r
    - *Boehmeria* spp.—*see* Ramie
    - canna, 1722
    - China grass—*see* Ramie
    - *Clappertonia filicifolia*, 1720
    - *Furcraea* spp., 3307
    - *Helicteres isora*, 4029
    - hemp (*Cannabis sativa*), 4028
    - *Hibiscus cannabinus*, 4027
    - *Hibiscus sabdariffa*, 4027
    - jute substitutes, 4027
    - kapok, 4030
    - Manila hemp—*see* Manila hemp
    - *Musa* spp., 1720
    - *Napaea dioica*, 4068r
    - *Neoglaziovia variegata*, 3278
    - New Zealand flax—*see Phormium*
    - in Nigeria, 1720
    - ramie—*see* Ramie
    - *Raphia ruffia*, 4038
    - *Sansevieria*—*see Sansevieria*
    - *Sida cordifolia*, 1720
    - sisal—*see* Sisal
    - of the United States, 2868
    - *Urena lobata*, 4027
  - production and trade, 2892
  - retting—*see above*, extraction
- *Ficus* spp. cuttings, heat injury to, 4151
- *Ficus* spp., leaf anatomy, 1190
- Fig—
  - caprification, 3494
  - climate, micro-, 1145m
  - composition, fruit, 1295a
  - cropping, double, 104
  - defoliation, growth substance delays, 1201
  - diseases, fungus, 1355
  - diseases, virus, 1332, 2546 l
  - fruit growth phases, 2224, 2264
  - growing in Italy, 89
  - morphology and biology, 141
  - pests, insect, 372c, 3654, 3658
  - pests, nematode, 2484
  - propagation by cuttings, 3464
  - processing, drying, 1235
  - processing, juice, 3539k
  - pruning, 141
  - research in North Africa, 2096
  - varieties, 103
  - water requirements, 2224
- Fiji, plant introductions, 3270e
- Filbert—*see under Corylus*
- Flavour in fruits, 201k
- Flavour in vegetables, 542v
- Flea beetle control—*see also particular crops*—1607, 1647b

Flooding—
  for disease control, 4282
  manuring after, 1122
  plant responses to, 267, 268, 1323, 3011e, 3979
  soil restoration after, 2129
Flora—
  of Angola, 3103
  arctic, 3348
  of Australia, 1455
  of the Belgian Congo, 2086
  of Belgium, 3323j
  of Malaya, 2085
  of the Sudan, 4494b
  of Tunisia, 3347
  of the U.S.S.R., 1814
Florida—*see also under* United States—agric. Exp. Stat., A.R., 2101
Flower(s)—*see also individual flower crops*—
  annual, a manual, 4450
  breeding, 2622
  colour, pigments involved in, 4072
  cut, prolonging life of, 78, 622, 3387, 4136
  cut, storage, 621, 702, 1751, 1790, 4162w, 4489
  diseases, 4076
  drop—
    in black currant, 1237
    in coconut, 894
    in vine, 3564
  grading, 625
  growing—
    in Canada, 1042, 1048
    under glass, 1061a
    in Great Britain, 6, 1022, 3324, 3325, 4450
    in India, 1813p, 3011x
    in Italy, 685, 2923
    in the U.S.A., 735m, 3011h
  harvesting by suction pump, 3002
  induction—*see also individual plants under* photoperiod—chilling requirements for, 2165
  pigments, anthocyanin, 3011w
  research in—
    Germany, 1744
    Great Britain, 2107
    Italy, 1745
    the U.S.A., 2097, 3308
  scent, diacetyl as a, 723
  seed—
    germination, 619
    production in the U.S.A., 3011r
    quality in New York, 2924
  storage—*see above*, cut
  thinning—*see* Thinning
  variety trials, evaluation of, 4094
Flowering—
  factors affecting, 79m, 2156
  growth substances to delay—*see* Growth substances
  hormones in fruit trees, 3515
Fluorescent substances in plants, 3443i
Fluorine—
  content of citrus leaves, 3068, 4203
Fluorine (*continued*)—
  content of tea, 3388
  determination, 3388
  injury, indicator plants for, 46
  injury to plants, 1325, 4106
Fodder, trees for, 4454
Foliar diagnosis—*see* Leaf analysis *and also individual plants under* composition *and* nutrition
Foliar nutrition—*see* Nutrition, foliar
*Fomes lamaensis*, 4340
*Fomes noxius*, 4434
*Food agric. Statistics, F.A.O., Yearbook*, 4470
*Food and Flowers*, a revived periodical, 2115
Forcing—
  asparagus, 2657
  azalea, 4144
  bulbs, 3321
  chicory, 490, 1058
  chrysanthemum, 4088
  forsythia, 617, 716
  hydrangea, 4490
  iris, 674, 4111
  lily, 678, 2964
  lily-of-the-valley, 1774
  narcissus, 655
  rhododendron, 716
  rhubarb, 2105
  *Sternbergia lutea*, 684
  strawberry, 214, 2337, 2395g
  tulip, 655, 1057, 2968
Forecasting—*see* Diseases, Harvesting time *and* Pest incidence
Forget-me-not, air pollution affects, 1084
*Forsythia* forcing, 617, 716
*Forsythia intermedia spectabilis*, 2998
Fort William Distr. Exp. Substat., Ont., Rep., 2102
*Fortunella* sp. flower structure, 1844
*Fragaria chiloensis*, 208, 2332
Frames—*see also* Glasshouse *and* Soil heating
  carbon dioxide supply, 66
  construction, 79q, 1058
  hail damage prevention, 3427
  irrigation, 68
  lights—
    from plastic material, 1495
    Dutch, cropping under, 1612, 2105
    putty for insertion, 2199
  ventilation, 71
Frame-working—*see also* Grafting—
  frost resistance enhanced by, 1189
  fruit trees, deciduous, 1177, 2246
  pecan, 3572e
  *Phyllanthus emblica*, 3266
France—
  apple growing, 1162
  asparagus growing, 428
  fruit growing, 3446, 3447
  lavender growing, 4022
  mushroom growing, 2718, 2720, 3873
  onion growing, 3878
  pea growing, 1565, 1566
  pests, 1297

- France (*continued*)—
  - pomological congress, 3539f
  - tropical agriculture, teaching of, 4266
  - vine growing, 2346, 3572g
- Freesia corm storage, 1770, 4104
- Freesia flower bud differentiation, 663
- French West Africa—
  - cacao growing and research, 4286, 4288
  - coconut growing and research, 889, 4312
  - coffee growing, 4325
  - oil palm research, 927
  - pineapple growing, 941
  - plant collections, 3102
- Friesdorf/Bad Godesberg gärtn. Versuchsanst., A.R., 1744
- Frost—
  - damage—
    - to apple—*see* Apple, climate
    - to apricot, 3580
    - to avocado, 747
    - to banana, 3586
    - to cauliflower, 1535
    - to cherry, 261
    - to citrus—*see* Citrus, climate
    - to deciduous fruit trees, 262, 1435n, 2418, 3586
    - to *Helianthus annuus*, 2416
    - insurance against, 4264p
    - to ornamental plants, 2418
    - to peach, 150, 3587
    - to pear, 2420, 3579
    - to pecan, 2387
    - to pineapple, 3586
    - to plum, 2416
    - to raspberry, 3545
    - to *Sansevieria* spp., 603
    - supercooling studies, 4218
    - to vegetables, 2418, 3586
    - to vine—*see* Vine, climate
    - to walnut, 2416
  - ground, on soil and grass surfaces, 79l
  - leaf temperature in relation to, 2793
  - protection—
    - costs of, 747, 1851
    - by drainage ditches, 264
    - by fans, 747, 1315, 1848
    - by fans and heaters combined, 1851
    - by fruit covers, 1930
    - by heaters, 265, 747, 766, 1312, 1851, 3689w
    - by smoke, 766, 1312, 2424
    - by soil covering, 1318
    - by sprinkler irrigation, 263, 1128, 1313, 1314, 2423, 3689w
    - by straw covers, 2426
    - by tent coverings, 766, 3429
  - resistance—
    - in apple—*see* Apple, climate
    - in apricot, 2295, 3481
    - in avocado, 3100v
    - biochemistry of, 1811
    - in black locust tree, 1811
    - in cherry, 3481
    - in chrysanthemum, 1757
- Frost—resistance (*continued*)—
    - in citrus—*see* Citrus, climate
    - factors affecting, 113, 150, 831, 1185, 1188, 1320, 2369, 2370, 2998, 3024, 3093, 3546
    - in forsythia, 2998
    - frameworking enhances, 1189
    - growth substances increase, 489, 2295
    - in hazel, 1289
    - in olive, 4264m
    - and osmotic pressure, 1757
    - in parsnip, 489
    - in persimmon, 3093
    - in plum, 3481
    - problems in Canada, 3297
    - in raspberry, 3546
    - in rose, 695, 1787
    - in stone fruits, 1186
    - in strawberry, 3551
    - in sugar cane, 4395
    - transpiration an indicator of, 1187
    - in tropical and sub-tropical plants, 2928
    - in tung, 831
    - in vine—*see* Vine, climate
    - of woody plants, 735k, 2984, 4139
  - spring, frequency related to earlier weather, 2194
  - susceptibility—*see above*, resistance
- Fruit—*see also individual fruits*—
  - air pollution injuries, 43
  - *Annual, The*, 2111
  - boxes—*see* Packing, containers
  - breeding in Holland, 4472
  - breeding in Sweden, 2226
  - browning, enzymic, 1216
  - bud development and frost resistance, 1186
  - bud formation, physiology of, 3515
  - by-products, seeds as, 2321
  - census, accuracy of, 1148
  - chimaeras—*see* Chimaera
  - collections—*see* Variety collections
  - colour changes, 201l
  - composition—
    - in the Philippines, 3781
    - reviews and tables on, 2305, 4453
    - vitamin B, 1236g
  - crops, nutrition, a book on, 4453
  - dehydration—*see* Drying
  - drop—
    - apple—*see* Apple
    - black currant, 1237
    - cacao—*see* Cacao
    - citrus—*see* Citrus
    - growth substances retard, 179-181, 184, 870, 871, 1199, 1237, 2380, 3048, 3133, 3501, 4211, 4212, 4490
    - pear, 1199
    - a review on, 1236l
    - vine—*see* Vine
  - early bearing, methods of inducing, 3505
  - flavour, constituents producing, 201k, 1242
  - fly(ies)—
    - baits for, 4276
    - cherry—*see* Cherry pests *and Rhagoletis*

- Fruit—fly(ies) (*continued*)—
  - control, insecticides for, 1384
  - in India, 3840
  - Mediterranean—*see Ceratitis capitata*
  - melon—*see Dacus cucurbitae*
  - Mexican—*see Anastrepha ludens*
  - olive—*see* Olive pests, fly *and Dacus oleae*
  - oriental—*see Dacus dorsalis*
  - Queensland—*see Strumeta tryoni*
- formation—*see also below*, growth—physiology of, 3515
- fumigation—*see* Fumigation
- grading—*see* Grading
- growing—*see also below*, varieties—
  - in Australia, 1072, 2214
  - bibliographies on, 1145b
  - in Canada, 97, 3306
  - in Chile, 4469
  - in the Comoro Islands, 4271
  - economics of, 84, 85
  - in Germany, 201i
  - in Great Britain, 2, 6, 86, 201h, 1078, 3324, 3325
  - at high altitudes, 3449
  - in Holland, 201o
  - in India, 3100e, 3105
  - in Indonesia, 840
  - in Italy, 87, 201r, 201x, 1019
  - manuals on, 1019, 1032, 2092, 3286, 4452
  - in New Zealand, 1047, 2120
  - in North Africa, 201p, 2092, 3448
  - in Nyasaland, 3310
  - in Pakistan, 2124
  - in Réunion, 1017j
  - in South Africa, 2211, 3539m
  - in Switzerland, 2212
  - in the U.S.A., 1032, 1236p, 4452
  - in the U.S.S.R., 3449
  - in Yugoslavia, 3330
- growth, hormonal mechanism of, 3539 l
- growth, a review on, 3367
- harvesting—*see* Harvesting
- juice manufacture, 3539k
- marketing, 80g, 83
- moth, oriental (*Cydia* (=*Grapholitha*=*Laspeyresia*) *molesta*), 331, 332, 1056, 3634, 3650
- packing—*see* Packing
- pests, a book on, 3287
- pests in Canada, 1435i
- preservation in India, 3269y
- processing, candying, 1236a
- production and trade, world, 1146, 2111
- research—
  - in Australia, 2109, 2215
  - in Belgium, 2213
  - in Canada, 2102
  - in Germany, 2217
  - in Great Britain, 1147, 2107
  - in India, 2108
  - at Lausanne, 1044
  - in New Zealand, 2099
  - in South Africa, 2216
  - in the U.S.A., 2097

Fruit (*continued*)—
- respiration, 3368, 3515
- ripening by ethylene—*see* Ethylene
- ripening, factors affecting, 1191
- seed—*see* Seed
- set—*see* Growth substances
- sports—*see* Chimaeras
- statistics in the U.S.A., 82
- storage—*see* Storage
- surface area measurement of, 2285
- thinning by growth substances—*see* Growth substances
- tree(s)—*see also* Orchards—
  - frost resistance—*see* Frost
  - fumigation—*see* Fumigation, tree
  - growth and development, a review, 3539s
  - growth, factors affecting, 1236 l
  - grubbing, 3436
  - heart rots in, 2448
  - irrigation—*see* Irrigation
  - manuring—*see* Manuring
  - planting, 3437
  - pollination—*see* Pollination
  - ringing, 1236h, 3505
  - rootstocks—*see* Rootstocks
- tropical—*see* Tropical
- varieties—*see also above*, breeding *and* growing—
  - in Belgium, 2322g
  - new, lists of, 10
  - in the U.S.A., 201d
- and Vegetable Products Res. Cttee, Canada, A.R., 4466
- water transfer to leaves from, 4177
- *Yearbook*, 1049

Fuchsia propagation by cuttings, 4070

Fumigation—
- of botanical collections, 1145n
- for chafer control, 3641
- chamber, a mobile, 1399
- of cuttings, 4147
- of fruits, 844, 3689t
- glasshouse, 1516
- injury to carnation, 636
- injury to citrus, 3067
- plastic covers for, 1372, 1398, 1444
- of roots, 3893
- soil—*see also* Soil sterilization—
  - with carbon disulphide, 795
  - with chlorobromopropene, 675, 1580
  - with chloropicrin, 795, 3948, 4007
  - with D-D (dichloropropene-dichloropropane), 795, 1689, 1866, 2647
  - equipment for, 1145p, 2207
  - with ethylene compounds, 795, 1383, 1519, 1689, 2343, 2647, 3641
  - methods of application, 1547
  - with methyl bromide, 401, 543b, 636, 1444, 1445, 1484, 1755, 2343, 3067
  - for nematode control—*see* Nematode control
  - for ornamentals, 1758
  - plant composition affected by, 509
  - vegetable responses to, 1580, 1648b

Fumigation—soil (*continued*)—
  for weed control, 385, 401, 1444, 1445, 1484, 2565, 4007
 of strawberry plants, 1372
 tree, with HCN, 709, 1398, 1912n
 tree, with methyl bromide, 1399, 2501
Fungi—*see also individual species and plants under diseases*—
 edible—*see also* Mushroom—1031, 1591
 insects as vectors of pathogenic, 1905
 nematode control by, 2830
 poisonous, 1031
 soil, factors affecting pathogenicity, 3786
 for weed control, 3281
Fungicides—*see also* Antibiotics, Sprays *and individual diseases and hosts*—
 acidic buffer sprays, 2821
 actidione, 300
 barium ethylene bisdithiocarbamate, 3630
 biological control upset by, 1998, 2520
 biphenyl derivatives, 293, 1231
 calcium cyanamide, 2642
 chlorophyll content of leaves affected by, 2517
 copper—
  injury to plants, 1415
  pollen germination inhibited by, 3129
  residues, 367, 368, 371, 3259, 3679
  synergistic action, 1418, 3622
 dehydroacetic acid, sodium salt of, 361
 2,3-dichloro-1,4-naphthoquinone (phygon) and related compounds, 1417, 3078, 3690y
 diphenyl—*see above*, biphenyl
 ethylenethiourea derivatives, 3690o
 ferric dimethyl dithiocarbamate (ferbam), 1435s
 fruit composition affected by, 3669
 growth substances as, 195, 1419, 2701
 heptadecyl glyoxalidine acetate (glyodin), 291, 3690y
 insecticidal action of, 1056
 insecticides applied with, 247
 lime-sulphur, 368, 3680, 3690e
 manganese dimethyl dithiocarbamate, 1638
 mercurial, 291, 1418, 1774, 2456, 2825
 mixture, eradicant and protectant, 289
 N-trichloromethylthiotetrahydrophthalimide (captan, orthocide 406, SR 406, etc.), 289, 291, 359, 360, 1339, 2545a, 3608, 3623, 3624, 3674
 quaternary ammonium, 1603
 residues—*see also below*, toxicity—determination, 369
 reviews on, 248, 2519, 3668
 russeting of apples affected by, 359, 360, 2516, 2545a
 for seed disinfection—*see* Seed treatment
 sodium ethylene bisdithiocarbamate (nabam), 1435s, 2526
 soil, for club-root control, 3955i
 sulphur—*see also above*, lime-sulphur—
  action of, 3625
  for brown rot control, 295
Fungicides—sulphur (*continued*)—
  injury to plants, 1415
 synergistic action, 1359, 1418, 3622
 systemic, 571, 1419, 2545g
 testing, 1554, 3955i
 toxicity to man, 1414, 2526
 for vegetables, 1647r
 volatile, for storage rot control, 1231, 4247
 for woody ornamentals, 4162c, 4162t
 zinc ethylene bisdithiocarbamate (zineb), 1056, 2526, 3622-3624
*Furcraea* spp. as fibre plants, 3307
Fusaric acid, 3409, 3410
*Fusarium*—*see also* Damping-off—
 *bulbigenum* var. *nelumbicolum*—*see also* Tomato diseases, fungus, wilt—2977
 *culmorum*, 1641, 3795
 *dianthi*, 634, 4085
 *herbarum*, 4008
 *javanicum*, 4051
 *lycopersici*—*see* Tomato diseases, fungus, wilt
 *nivale*, 2976
 *oxysporum*—
  var. *aurantiacum*, 1769
  f. *conglutinans*, 1536
  var. *cubense*—*see* Banana diseases, fungus, panama
  f. *gladioli*, 670, 671, 3672, 4107, 4108
  f. *lycopersici*—*see* Tomato diseases, fungus, wilt
  f. *pisi*, 457
  f. unspecified, 423, 676, 937, 3829
 *roseum*, 634
 *solani*, 526, 1642, 3865
 spp. on—
  aster, 1752
  banana, 852
  citrus, 791
  cucurbits, 451, 3837
  eggplant, 3948
  orchid, 690
  pea, 2699
 *xylarioides*—*see Gibberella xylarioides*
*Fusicladium*—*see also* Apple diseases, fungus, scab, *and* Pear diseases, fungus, scab—
 *carpophilum*, 2465, 3618
 *pirinum* var. *pyracanthae*, 725
*Fusicoccum amygdalis*, 2463
Futuna Island, insect pests of, 1016l

*Gaillardia pulchella*, 3011g
Gall midges—
 of flowers, 2942
 of fruit crops, 3644, 4077
 of ornamentals, 1766, 4077
Gamma-radiation, plant mutations induced by, 1096, 3452
Gamma-radiation, plant sensitivity to, 1095
*Ganoderma lucidum*, 937
*Garcinia morella*, 1742l
Gardenia—
 flower storage, 1790
 nutrition, 2989
 pests, 4152

- Gardening—
  - *Annual, Amateur*, 1040
  - manuals on, 1061a, 4456, 4494a
  - in the tropics, 2084
- Gardens in ancient Greece, 616
- *Gargaphia solani*, 1521
- Garlic—
  - composition, bulb, 543i
  - diseases, 2760
  - growing in California, 2838q
  - pests, 483, 2838r
  - taxonomy, 1593
- *Gartenbauwissenschaft, Die*, a revived periodical, 4492
- Gas pressure, pest control by, 2967
- Gas storage—*see* Storage, gas
- Geiger-Müller counters, 79u
- Geisenheim/Rheingau, work at, 3298, 4471
- *Gentiana lutea*, 4008
- Georgia Exp. Stats, A.R., 4494e
- Geranium—*see also Pelargonium*—
  - diseases, 1749, 1760, 1761, 1813i, 3672
  - growing in Algeria, 1718
  - *macrorrhizum*, 4019
  - oil, 836, 4019
  - propagation by cuttings, 3672
- Gerbera—
  - *jamesonii*, 4274
  - nutrition, 1743
  - propagation by cuttings, 4093
  - soil pH, 2943
- Germany—
  - fruit growing and research, 201i, 1236f, 1236j, 2217, 3540
  - fruit imports, 201e
  - mushroom growing, 2721
  - plant quarantine, 2398
  - sprinkler irrigation, 2209a
  - strawberry growing, 1034
  - tobacco growing, 2842
  - vegetable seed production, 2838u
  - vine growing, 2349, 3557
  - walnut growing, 2392
- Germination—*see* Seed
- Germinators for oil palm seeds, 931
- Ghent, Stat. Rech. Amél. Plantes ornement., 618
- Gherkin—*see under* Cucumber
- *Gibberella xylarioides*, 1995, 4343
- Gigas forms of cultivated plants, 3357
- Ginger growing in Australia, 4004
- Ginger nutrition, 836
- *Ginkgo biloba*, 4153
- Girdling—*see* Ringing
- Gladiolus—
  - climate, air pollution, 43, 46, 4106
  - corm—
    - curing, 665
    - dormancy breaking, 667
    - storage, 4490
  - cormels, 664, 666
  - diseases—
    - fungus—
      - *Curvularia lunata*, 669
- Gladiolus—diseases—fungus (*continued*)—
      - fusarium rots and yellows (*Fusarium* spp.), 670, 671, 3672, 4107, 4108
      - *Penicillium gladioli*, 3672
    - iodine treatment for, 2643
    - non-parasitic, 2961, 2962
    - virus, 735 l, 735t
  - flower bud formation, factors affecting, 664
  - growing in the U.S.A., 1771, 4162m
  - nutrition—
    - foliar, 668, 1502, 2962, 4105
    - manuring, 1057, 1771, 4489
    - minor elements, 668, 1502, 2962, 3301, 4074
  - pests, mite, root (*Rhizoglyphus rhizophagus*), 672
  - pests, thrips (*Taeniothrips* spp.), 735q
  - photoperiodic response, 664, 2961
  - research in the U.S.A., 2101
  - soil management, weed control, 1059, 2582, 2583, 3753
- Glass—
  - covering soil with, 2800
  - substitutes, 1495
  - types, light penetration affected by, 69
- Glasshouse(s)—*see also* Frames—
  - air humidification in, 79x
  - air pollution in, 44, 45, 1082
  - in Belgium, 79v
  - carbon dioxide concentration raised in airtight, 3426
  - construction, 493, 1647n, 1744, 3425
  - crops—
    - flowers, 1061a
    - pollination by bees, 3432, 3491
    - pollination, factors affecting, 64
  - fumigation, 1516
  - hail damage, prevention of, 3427
  - heating, 79c, 500, 1058, 1132, 1133, 1496, 1497, 3443m, 3443t, 3767
  - illumination—*see also* Light, artificial—498, 1138, 2166, 3321, 3430, 4162v
  - irrigation, 67, 68, 447, 1744, 4133
  - insulation, 1134
  - mobile, 3425
  - pests, control of, 1061 l, 1435i
  - putty for glass insertion, 2199
  - research in various countries, 1041, 2107, 3302
  - trials, design and analysis, 3344
  - ventilation, 2799
  - weed control in, 2581
- *Gloeodes pomigena*, 359
- *Gloeosporium*—
  - *album*, 1221, 3605
  - *fructigenum—see Glomerella cingulata*
  - *laeticolor*, 297
  - *olivarum*, 4257
  - *perennans*, 3605
  - sp. on papaw, 940
  - sp. on strawberry, 3621
- *Glomerella cingulata*, 714, 793, 2001, 3011b, 3674, 4361
- Gloxinia seed germination, 2162

- Gloxinia variety trials, 4094
- Glutamine, radioactive, 1145d
- *Glycine javanica*, 3018
- *Glycosmis arborea*, 1742d
- *Gnomonia fructicola*, 2470
- Gold Coast, cacao growing, 1936
- Gold Coast Dep. Agric., A.R., 2103
- Gooseberry—
  - breeding, 204
  - Chinese—*see* Chinese
  - composition, fruit, 1211
  - diseases, fungus, 204, 1351
  - diseases, non-parasitic, 1351
  - growing in Canada, 207, 1048
  - Indian—*see Phyllanthus* spp.
  - nutrition, manuring, 3541
  - nutrition, potassium, 2400
  - pests, birds, 1400
  - pests, sawfly, 2545j
  - pollination, 1238
  - spray residues, 371
  - varieties—
    - black-fruited, 204
    - disease resistance, 1351
    - general, 207, 218, 1048, 3540
- Gophers—*see under* Rodents
- Gorse control, 3699, 3733
- *Gracilaria henriquesiana*, 4066
- Grading—*see also* Packing—
  - colour, apparatus for, 1883
  - cucumbers, machines for, 1058
  - flower, machines for, 625
  - fruit—
    - light for, 1058
    - machines for, 77, 3532, 3533, 4244
    - systems, 191, 201q, 2200
  - tobacco, 2840
- Grafting—*see also* Frameworking *and individual plants*—
  - anatomy of union, 2252
  - approach, 704, 1622, 3467
  - cleft, 110
  - conifers, 1812
  - growth substances an aid in, 1809, 3563
  - inter-family, 409
  - intergeneric, 4057
  - by machine, 225, 1982, 3562, 4328
  - methods, tree performance affected by, 3466
  - monocotyledonous plants, 3356
  - moss an aid in, 3004
  - paraffin wax an aid in, 226
  - plastic materials assist, 79k, 201n, 704, 732, 1797, 1798, 2204, 3004
  - plumule as scion, 1809
  - reproduction of old stock/scion combination by, 4170
  - root, to obtain clonal rootstock, 4165
  - wax dips for, 226
  - wound protectants, 226
- Granadilla—*see* Passion fruit
- Grape—*see* Vine
- Grapefruit—*see under* Citrus
- *Grapholitha molesta*—*see* Fruit moth
- Grass—*see individual species*, Lawn *and* Weed control
- Great Britain—
  - agricultural—
    - education, 2208x
    - research, 3296
    - statistics, 1078
  - apple varieties, 95
  - atmospheric pollution, 2546a
  - brussels sprouts growing, 2838z
  - cauliflower growing, 5420
  - cherry growing 3539i
  - cider apple growing, 4451
  - and the Commonwealth, agriculture, 1069
  - flower growing, 1022, 4450
  - flower research, 2107
  - fruit growing—*see also below*, small fruit—86, 201h, 1078
  - horticultural stations, experimental, 1062-1065, 4479
  - horticultural statistics, 3324, 3325
  - horticulture, 2, 6, 2208c, 3275
  - mushroom growing, 2727
  - raspberry growing, 3572i
  - seed testing, 2634
  - small fruit growing, 1295h
  - trees and shrubs hardy in, 735k
  - vegetable growing and varieties, 1029, 1078, 1527, 2838b, 3760
  - vine growing, 1023, 2090
  - weeds and their control, 2599
- Greece, gardens in ancient, 616
- Greece, vine growing, 2346
- Greengage—*see under* Plum
- *Grevillea robusta*, 1005
- Growth—
  - compensatory, 33
  - inhibitors—*see* Growth-substances, inhibiting
  - physiology of, 3539s
  - rate of trees, measurement of, 3485, 3486
  - regulators—*see* Growth-substances
  - rhythm of plants, 4130
  - vitamins affect, 25
- Growth-substances—*see also* Colchicine *and* Herbicides, *and under individual crops*—
  - abscission—*see also* Fruit drop—of calyx retarded by, 1884
  - abscission induced by, 2981, 2998, 3005
  - action, mode of, 2845, 3377, 3379, 3443w, 3539 l
  - alkaloid plants' responses to, 3711
  - albinism induced by, 3699
  - from apple seed, 2296
  - auxin, 29, 31, 2150, 2157, 2225, 2737, 3378, 3539 l
  - avocado responses to, 3014, 4170
  - in banana ovary, 4279
  - bean plants' responses to—*see* Bean
  - in bean seed, 79i
  - benzoic acid, substituted, 34
  - benzothiazol-2-oxyacetic acid, 2379
  - blossom thinning by—*see below*, fruit and flower thinning

- Growth-substances (*continued*)—
  - brassica responses to, 3308, 3383
  - *Bryophyllum* responses to, 4128, 4129
  - cacao responses to, 859
  - celery responses to, 3820
  - *p*-chlorophenoxyacetic acid (PCA, POA), 236, 1284, 4490
  - chlorophenoxypropionic acid compounds (CPP, etc.), 2659
  - chlorosis induced by, 3699
  - citrus responses to, 3028
  - from coconut, 3888
  - in *Coleus* internodes, 79n
  - *Coleus* responses to, 33
  - content, photoperiodism affects, 1145c
  - coumarin—*see also below*, inhibiting—2806
  - in cucumber seedlings, 79n
  - for cuttings—*see also below*, root—227, 228, 711, 718, 727, 728, 731, 760, 1172, 1173, 1236n, 1799, 1980, 3078, 3079, 3156, 3463, 3988, 4071, 4490
  - dahlia responses to, 3922
  - defoliation delayed by, 1201
  - determination, 26, 3381
  - 2,4-dichlorophenoxyacetic acid (2,4-D), 1107, 2208g, 2695, 3014, 3027, 3028, 3047, 3379, 3380
  - 2,4-dichlorophenoxymethane phosphonate, 2155
  - dormancy induced by, 2998, 3005
  - dormancy prolonged by, in onion, 481, 482, 2754, 3699, 3880
  - enzyme activity in relation to, 3384, 3385
  - extraction from plant tissue, 3381
  - flower induction affected by, 2659, 3820
  - flowering—
    - advanced by, 3308
    - affected by, reviews on, 80k, 3515
    - delayed by, 477, 1198, 2771, 3308, 3546, 3820
    - prolonged by, 4154, 4490
  - flowers, cut, life prolonged by, 3387
  - frost resistance increased by, 489, 2295
  - fruit—
    - colouring enhanced by, 181-185, 1200, 2110
    - drop retarded by—*see* Fruit drop
    - and flower thinning by, 173-175, 2284, 2286, 2287, 2289-2292, 3496, 3497, 4489, 4490
    - ripening affected by, 184-188, 1200, 1930, 2216, 2284, 2293, 2379, 2834, 3368, 3499
    - set induced by, 1284, 1954, 2834, 4298, 4301
    - set prevented by, 4142
    - size affected by, 184, 236, 2293, 3567, 4212, 4264z
    - storage life prolonged by, 803, 3500, 3517
  - fungicidal action of, 195, 1419, 2701
  - -fungicide mixtures, 871
  - for grafting, 1809, 3563
  - hevea responses to, 2026
  - inactivation by fungus, 2151
  - indole derivatives, separation of, 2208k
- Growth-substances (*continued*)—
  - indoleacetic acid (heteroauxin), 32, 36, 79d, 189, 542q, 1104, 2078h, 2151, 2209b, 2441, 3379, 3381, 3382, 3384, 3921, 4010
  - indoleacetonitrile (IAN), 79d, 1108, 3921
  - indolepyruvic acid, 3382
  - inhibiting—*see also* Seed germination, inhibitors—
    - action of, 32, 80k
    - in bean seed, 79i
    - chemistry of, 31
    - coconut oil, 1675
    - coumarin, 37, 1615, 2173
    - 2,4-D—*see above*, 2,4-dichlorophenoxyacetic acid
    - maleic hydrazide—*see below*, maleic hydrazide
    - in pea roots, 2152
    - riboflavin does not counteract, 1485g
  - interaction between two, 3379
  - isonicotinic acid hydrazide, 3385
  - isopropyl phenyl carbamate, 482
  - latex flow stimulated by, 1017x, 3190
  - lawn responses to, 2974
  - legume responses to, 34
  - light affects, 28, 29
  - maleic hydrazide, 477, 481, 645, 1113, 1145i, 1145j, 1596, 1677, 2153, 2342, 2754, 2974, 2985, 3387, 3546, 3699, 3820, 3880, 4154, 4301, 4490
  - a manual on, 1018
  - for marcotting, 1794, 4205
  - α-methoxyphenylacetic acid (MOPA), 1109, 1110, 2208z
  - methyl naphthaleneacetate, 482
  - mushroom responses to, 1590
  - naphthaleneacetamide, 2286, 2287
  - β-naphthylalanines, 2149
  - α-(1-naphthylmethylsulphide)-propionic acid (NMSP), 1105
  - nomenclature, 3375
  - nucleic acid affected by, 36
  - onion responses to, 477
  - pantothenic acid, 1630
  - parthenocarpy induced by—*see* Parthenocarpy
  - pea response to—*see* Pea
  - persistence in dormant tissue, 3380
  - phenylacetic acid, 1109
  - phlox responses to, 3922
  - photoperiodism affects, 3382
  - photosynthesis affected by, 3047
  - pineapple fruit breakdown controlled by, 2015
  - pollen treated with, 3922
  - quaternary ammonium compounds, 2691
  - radish responses to, 2771
  - respiration affected by, 1145k, 3071
  - reviews on, 3376-3378, 3539 l
  - root abnormalities induced by, 34
  - root branching induced by, 1169
  - root formation—*see also above*, cuttings—induced by, 2806, 3888
  - rose responses to, 1788

- Growth-substances (*continued*)—
  - seed responses to, 561, 3386, 3845
  - soil application, 2802
  - spinach responses to, 2784
  - storage life of flowers prolonged by, 3387
  - storage life of fruit prolonged by, 3071, 4246
  - strawberry responses to, 216
  - sugar cane responses to, 4396
  - sunflower responses to, 3379
  - tests, 27, 79d, 79r, 3443b
  - for thinning fruit—*see above*, fruit
  - tobacco axillary growth suppressed by, 1672, 4490
  - tomato responses to—*see* Tomato
  - transfer from plant to plant, 1110, 2208z
  - translocation, 30, 1109, 2157, 2691, 4490
  - transplanting facilitated by, 560
  - trichlorobenzoic acid, 543 l
  - 2,4,5-trichlorophenoxyacetic acid, 1111, 1200, 2026
  - 2,4,5-trichlorophenoxypropionic acid, 179, 180, 3501
  - 2,3,5-triiodobenzoic acid, 543 l, 3922
  - vine responses to—*see* Vine
  - virus diseases retarded by, 424
  - xanthinin, 2208m
  - yields increased by, 3386
- Guard cells, stomatal, 2161
- Guatemala, orchids of, 2080
- Guava—
  - bibliography, 4447g
  - composition, fruit, 922, 4347
  - composition, leaf, 4446e
  - products, essential oil, 2078e, 2078f
  - products, wine, 4446z
  - propagation, vegetative, 4346
  - storage, 4347
  - varieties, 10, 3170, 3171
- Guayule—
  - breeding, 1742i
  - by-products, resin, 615d
  - diseases, 615k
  - growing in Spain, 2902
  - rubber content, 1742m
  - seed thresher, 4056
  - varieties, 4490
- *Guignardia aesculi*, 4149
- *Guizotia abyssinica*, 1050
- Gulval exp. Stat., A.R., 2104
- Gum(s)—
  - arabic from *Acacia senegal*, 841, 4067
  - locust, 1050
  - plants in India, 1707
  - plants in the U.S.A., 2868
  - sapodilla, 1017w
- Gummosis of fruit trees—*see separate species under diseases*
- Guttapercha, *Eucommia* a source of, 1733
- Guttapercha tree (*Palaquium gutta*), 3194
- *Gymnosporangium clavipes*, 289
- *Gymnosporangium juniperi-virginianae*, 289
- Gypsum in plant nutrition, 3926
- *Habrochila placida*, 3169
- Hail damage—
  - to fruit trees, 2427
  - protective measures against, 3427, 3429
  - to tea, 3258
  - to tobacco, 1676, 4490
- *Halogeton glomeratus*, 3725, 4465
- *Hamamelis* spp., horticultural, 1813 l
- *Hamamelis virginiana*, 1716, 4068i
- *Haplomyza chenopodi*, 543o
- *Haplopappus laricifolius*, 615g
- *Haplophyton cimicidum*, 4068u
- *Haptoncus luteolus*, 808
- Hardiness—*see* Frost resistance
- Hares—*see under* Rodents
- *Harrisina brillians*, 3651, 3689a
- Harvesting—
  - essential oil plants, 2879
  - fruit, general, 191
  - fruit, methods compared, 193, 201u
  - olives, economics, 822
  - time forecasting for peas, 1586
  - tomatoes, time studies, 543m
- Hawaii—
  - avocado growing, 4264o
  - banana varieties, 3111
  - cauliflower growing, 542m
  - coffee growing, 4323
  - cover crops, 2077
  - macadamia growing, 4265a
  - passion fruit growing, 4263
  - sugar cane growing, 2035, 2036, 4447f
  - sugar cane research, 2035, 2036
- Hawthorn pests, 3644
- Hawthorn seed germination, 717
- Hazel—*see under Corylus*
- Heat injury to plants, 1322, 4151, 4361
- Heat resistance of bean, 2680
- *Hedera helix*, rejuvenation by grafting, 2174
- Hedge(s)—
  - growth control by maleic hydrazide, 2985
  - ornamental, 1791
  - plants—
    - a collection of, 3102
    - fruit trees as, 2083, 3473
    - *Rosa multiflora* as, 1032
  - as windbreaks, 2641, 3143
- *Helianthemum* sp., pollen, abnormal, 1813t
- *Helianthus annuus*, 2416
- Helicopter—*see under* Aeroplane
- *Helicotylenchus* sp. on boxwood, 4146
- *Helicteres isora*, 4029
- *Heliothis armigera*, 2655, 3933
- *Heliothis virescens*, 2861, 3994
- *Heliothrips haemorrhoidalis*, 1867
- *Heliotropium europaeum*, 382
- *Helix similaris*, 735g
- *Helminthosporium papulosum*, 359
- *Helminthosporium torulosum*, 2893
- Hematin in plants, 3443 l
- *Hemileia* spp. on coffee, 912
- *Hemileia vastatrix*, 913, 1994, 4323
- *Hemitarsonemus latus*, 917, 960
- Hemlock (*Conium maculatum*), 3711

Hemp, Manila—*see* Manila hemp
Hemp, *Cannabis sativa*, 4028
Henbane—*see Hyoscyamus*
*Hepialus* spp. as pests, 3690a
*Heracleum spondylium*, 376
Herbs, culinary—
  in Denmark, 4457
  in Holland, 1647c, 4472
  weed control in, 3754
Herbicides—*see also* Weed control *and individual weeds*—
  amino triazole (ATA) and its derivatives, 3699, 3722
  aromatic solvents, 2571, 2573
  arsenical, 1465, 1469, 2556, 2580, 3700
  aryloxy compounds, 1441
  boron trioxide, 3701
  chlorobromopropene, 385
  3-(*p*-chlorophenyl)-1,1-dimethylurea (CMU), 377, 381, 1446-1448, 1475, 1483, 2558-2561, 2600, 3703, 3706
  copper sulphate, 3759o
  cyanamide compounds, 1442, 2063
  as defoliants, 2063, 2981, 2998, 3005
  2,4-dichlorophenoxyacetic acid (2,4-D)—*see also* Growth substances—
    action, physiological—*see also below*, 2,4-D translocation—1450, 3720, 3759m
    bees poisoned by, 3678
    carriers for, 2576, 3734, 3735
    droplet size, 378
    esters, volatility and drift, 2563, 2620, 2621k, 3710, 4465
    general, 3699
    injections, 1462
    injury to cultivated plants—*see also below*, 2,4-D, response—390, 1478, 1480, 2598, 2614, 3712, 3713, 3740
    pellets, 1473
    for perennial weed control, 3709
    persistence and movement in soil, 1451
    radioactive, 3729
    response of cultivated plants to—*see also above*, 2,4-D injury—399, 2563, 2620, 2621k, 3712
    soil microbial activity affected by, 1477
    translocation—*see also above*, 2,4-D action—2549
    weed susceptibility to, 3712
  3,3-di-(4-chlorophenyl)-2-methyl-pseudo-urea, 1449
  2,4-dichlorophenoxyethyl benzoate (sesin), 2600
  2,4-dichlorophenoxyethyl sulphate (Experimental Herbicide No. 1), 388, 1483, 2562, 2593, 2600, 2619, 3707
  2,2-dichloropropionic acid (dalapon), 1485b
  dinitro compounds, 374, 393, 1483, 3699, 3757
  3,6-endoxohexahydrophthalate, disodium (endothal, niagarathal), 2981, 2998, 3005, 3699, 3714
  equipment for applying, 1438, 1485a, 1485c, 1485h, 2571, 2621a, 2621c, 2621d, 3706, 3759b
Herbicides (*continued*)—
  for hedge growth control, 2985
  injury, activated carbon sprays prevent, 2595
  injury to cultivated plants—*see also above*, 2,4-D—1453, 2550, 2560, 2584, 2611, 2619, 3583, 3753
  iso-propyl phenyl carbamates (IPC, IPPC and chloro-IPC), 374, 380, 1451, 1452, 2600, 2601, 2621b, 3759g, 3759l
  machinery for applying—*see above*, equipment
  maleic hydrazide—*see also* Growth substances—1114, 3387, 3699
  2-methyl 4-chlorophenoxyacetic acid (MCPA, agroxone, methoxone), 3678, 3712
  N-1-naphthyl phthalamic acid (alanap), 1483, 2610, 2612, 2613, 3715
  nitrate, ammonium, 1472
  nitrate, Chilean, 3702
  octachlorocyclohexenone (oktone), 3699
  oil, 379, 393, 1454, 1482, 2611
  pellets, 1473
  pentachlorophenol, 3705
  persistence and movement in soil—*see also above*, 2,4-D—1447, 1451, 2621g
  phenoxyethyl compounds, chlorinated, 2600, 3708
  physiological effects—*see also above*, 2,4-D, action—1439
  potassium cyanate, 1482
  reviews on, 404f, 1440, 2519, 3668, 3698, 3759f
  rosin amine D acetate, 2571
  sodium—
    arsenite, 2580, 4340
    chlorate, 3583, 3701
    dinitro-ortho-secondary-butyl phenate, 3757
  soil micro-organisms affected by, 1114, 1477, 2621h
  soil sterilants as, 1443, 1446, 1485d, 3696, 3700, 3706
  testing, 2552
  toxicity to man, 1414
  translocation of—*see also above*, 2,4-D—2578
  trichloroacetate (TCA), 1464, 2621g
  2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 2563, 2620, 2621k, 3759i
  2(2,4,5-trichlorophenoxy) propionic acid (silvex), 3716
  urea compounds—*see also above*, CMU—1442
  for woody plant control—*see* Woody plants
*Heterodera marioni*, 423, 575, 836, 2828
*Heterodera tabacum*, 1697k
*Heteronychus plebejus*, 991
*Heteronychus sanctae-helenae*, 1785
*Heteropatella antirrhini*, 2951
*Heterotermes cardini*, 4417
Hevea—
  *benthamiana*, 2025
  breeding and selection, 1016r, 4358
  climate, heat injury, 4361

- Hevea (*continued*)—
  - climate, temperature responses, 952
  - clones—*see also below*, seedlings—951, 1016u, 2023, 2024
  - composition, latex—*see below*, latex, chemistry
  - composition, leaf, 2078h, 4359
  - diseases—
    - fungus—
      - anthracnose (*Colletotrichum ficus*), 958
      - black crust (*Catacauma huberi*), 4361
      - black thread or stripe (*Phytophthora palmivora*), 4361, 4490
      - *Glomerella cingulata*, 4361
      - mildew (*Oidium heveae*), 959
      - pink disease (*Corticium salmonicolor*), 4361
      - root (*Armillaria*, *Fomes* and *Ganoderma* spp.), 4361
      - South American leaf blight (*Dothidella ulei*), 2027, 3270r, 4361
      - target leaf spot (*Pellicularia filamentosa*), 4361
    - in India, 1016x
    - non-parasitic, collar rot, 4361
  - economics, 4447b
  - fruit growth, 3186
  - growing in—
    - Brazil, 3270r
    - the Cameroons, 2119b
    - Liberia, 4357
    - S.E. Asia, 3270r
  - growth measurement, 3186
  - latex—
    - ageing characteristics, 3191
    - chemistry—*see also below*, latex properties—962, 1016f, 1016m, 2029, 2032, 2033, 2079c, 2079e, 4447k, 4447q, 4447r
    - impurities in, 3270s
    - marketing, 2028
    - preservation, 961, 2031
    - processing, 1017i, 2030
    - properties—*see also above*, latex chemistry—1016i, 1017d, 2034
    - stimulation—
      - by acetates, 4490
      - by growth substances, 1017x, 2026, 3190
      - by minor elements, 1017x
    - yields, 2026, 4358
  - leaf, composition, 2078h, 4359
  - leaf, defoliation by chemicals, 2026
  - mycorrhiza, 3187
  - nutrition—
    - manuring, 955-957
    - mineral deficiencies, 957, 3192
    - studies, soilless culture for, 4360
  - pests—
    - ants, 1918
    - control on seedlings, 4446n
    - mite, yellow tea (*Hemitarsonemus latus*), 960
  - planting—
    - mechanized, 4447b

- Hevea—planting (*continued*)—
    - spacing, 3188, 4358
    - transplanting techniques, 953
  - production and trade, 1914
  - propagation by cuttings, 952, 2025
  - research—
    - in the Belgian Congo, 834
    - in Ceylon, 833, 948
    - design of trials, 950, 954
    - in Holland, 4446d
    - in Indo-China, 949, 4446 l
    - in Indonesia, 3193, 4272, 4447o
    - in Malaya, 947, 961, 2021
  - root mycorrhiza, 3187
  - seed growth, 3186
  - seedlings, clonal, 1016u, 2022
  - as a shade tree, 4327
  - soil management, weed control, 2026, 3751
  - soils in Indonesia, 3193
  - *spruceana*, 2025
  - tapping, 3189
  - Testatex sampling, 1016r
  - varieties—*see above*, clones *and* seedlings
- *Hibiscus*—
  - *cannabinus*, 4027
  - *esculentus*—*see* Okra
  - *sabdariffa*, 4027
  - spp., ornamental, nutrition, 1502, 4274
  - spp., ornamental, propagation, 1804
- Hickory (*Carya* spp.) composition, 1290
- High-frequency vibration treatment for seed, 3371
- *Hippeastrum* diseases, 4109
- *Hippeastrum* flower bud differentiation, 656
- Hoes—*see* Tools *and* Machines
- Holland—
  - apple growing, 1163
  - bulb growing, 2956
  - flooding effects, 2129
  - fruit growing, 201o
  - hevea research, 4446d
  - horticultural education, 4163i
  - marketing horticultural produce, 80g
  - mushroom growing, 2723
  - peach growing, 1151
  - soils, 79w
  - strawberry growing, 3572r
  - tropical agriculture, education, 1913
  - vegetable growing, 1647e
  - vine growing, 2346
  - weed control, 3695
- Holly—
  - deciduous, 2999
  - pests, 4143
  - propagation by cuttings, 718
  - seed germination, 703
- Hollyhock pests, 4095
- Honey plants, sugar concentrations of, 16
- Hong Kong—
  - Dir. Agric., A.R., 2119d
  - flowering trees and shrubs, 1813g
  - vegetable growing, 1491
- Hop—
  - breeding, 4040, 4041, 4047

- Hop (*continued*)—
  - composition, cone, 605-607, 610, 1730-1732, 4040, 4048, 4068a
  - composition, plant, 606
  - diseases—
    - fungus—
      - downy mildew (*Pseudoperonospora humuli*), 608, 3674, 4041
      - powdery mildew (*Sphaerotheca humuli*), 4041
      - wilt (*Verticillium albo-atrum*), 609, 615j, 4040, 4041, 4044, 4068 l
    - virus, 2922d
  - flowers, male, 4040
  - growing in Argentina, 1727
  - growing in Canada, 207
  - leaf stripping, chemical, 2898
  - nutrition—
    - boron, 2897
    - manuring, 4043
    - nutrient intake, 606
  - pests—
    - a book on, 3287
    - insect, 4045, 4046
    - mite, 4045
  - picking, 610, 2896, 4041, 4042, 4047
  - planting, spacing, 1729, 4042
  - planting, wirework, height of, 4042
  - propagation by cuttings, 4046
  - research in—
    - Australia, 4482
    - Great Britain, 2895, 4039
    - New Zealand, 604, 1038, 1047, 2099
  - soil acidity affects, 4043
  - varieties, 10, 610, 1728, 2896, 4040, 4041, 4068 l
- *Hoplocampa*—
  - *brevis*, 338, 2514
  - *flava*, 338, 2513
  - *minuta*, 338, 2513
  - *rutilicornis*, 338
  - *testudinea*, 338, 339, 1435k, 3655, 3656
- *Hoplochelus rhizotrogoides*, 991
- *Hormodendron* sp. on banana, 4280
- Hormones, plant—*see* Growth substances
- Horse-radish propagation, 1091
- Horticultural—
  - Congress, London, 13th int., 1061n
  - Education Ass., A.R., 2105, 2119e
  - education in Great Britain, 790
  - education in Holland, 4163i
  - Engng Inst., Wageningen, 1067
  - nomenclature, 1145g, 1145h
  - organizations in the U.S.A. and Canada, 1145q, 1145r
  - Products Lab., Vineland, Ont., 4484
  - research in—
    - the Belgian Congo, 3329
    - Belgium, 1068
    - Ceylon, 833
    - Morocco, 3444d
    - Queensland, 837
  - Stations, exp., in Great Britain, 1062-1065, 4479
- Horticultural (*continued*)—
  - statistics, 1078, 3324, 3325
- Horticulture—*see also* Agriculture *and* Gardening—in—
  - Canada, 1042, 1070, 1071, 2123
  - Denmark, 2208c, 3280
  - Great Britain, 2208c, 3275
  - Indonesia, 3107
  - Sardinia, 1028
  - Yugoslavia, 3330
- House plants, propagation by cuttings, 2204, 2206
- House plants, window boxes for, 2930
- Humic acid and root growth, 2158
- Humidifiers for propagation, 79x, 705, 2927, 3078
- Humidity control in chambers, 1137
- Humulon—*see* Hop composition
- Hyacinth—*see also* Bulbs—
  - breeding, 2956
  - irrigation, 654
  - nutrition, 673
  - pests, 4110
  - propagation, 1772
- *Hyalarcta hubneri*, 735r
- Hybrid vigour in—
  - castor bean, 4058
  - cucumber, 1550
  - tobacco, 3964, 3967, 4003a
  - tomato, 1617, 2791
  - vegetables, 3763
  - watermelon, 1557, 2677, 2838y
- Hybridization, vegetative—
  - of medicinal plants, 1708
  - plant sap injection causes, 2794
  - use in breeding, 91
- *Hydraecia xanthenes*, 3789
- *Hydrangea*—
  - diseases, virus, 719
  - flower colour, 1806
  - forcing, 4490
  - nutrition, 1805, 1806, 3000
  - pests, nematode, 3001
  - varieties, 735a
- Hydrocyanic acid in stone fruit seeds, 3516
- *Hylemyia*—
  - *antiqua—see Delia antiqua*
  - *brassicae—see Erioischia brassicae*
  - *cana*, 1584
  - *cilicrura—see Delia cilicrura*
  - *liturata*, 1584
- *Hylesinus fici*, 372c
- *Hylocoetus dermestoides*, 1379
- *Hylodendron gabonense*, 4065
- *Hymenaea courbaril*, 1050
- Hymenoptera, a book on, 2082
- *Hyoscyamus niger*, 588, 1708, 1709
- *Hyoscyamus* spp., diseases, virus, 3810
- *Hypericum perforatum—see* St. John's wort
- *Hyphantria cunea*, 336, 372m, 372w, 2508, 3689g
- *Hypoborus ficus*, 89
- *Hyponomeuta* spp., control, 2522, 3667

*Hypothenemus hampei—see Stephanoderes*
*Hysteroneura setariae*, 4410

*Icerya purchasi*, 796, 1870
*Idiocerus atkinsoni*, 924
*Ilex—see also* Holly—*opaca*, 4143
*Ilex verticillata*, 2999
Illinois agric. Exp. Stat., Rep., 2106
*Impatiens*—
  *balsamina*, 3922
  *holstii* anatomy, 1813f
  *holstii* diseases, 1697d
*Imperata cylindrica*, 3746, 3750, 3751
Imperial Coll. trop. Agric., A.R., 838, 1939, 3323h
Inarching, graft—*see* Grafting, approach
Incompatibility—*see* Pollination *and individual crops under* rootstocks *and* pollination
India—*see also individual States for reports*—
  avocado growing, 3100b
  banana growing and varieties, 1025
  black pepper growing, 1702
  cinchona growing, 4309
  citrus growing, 3100t
  coffee growing, 3155, 4323, 4446f
  flower growing, 1813p, 3011x
  fruit—
    growing, 3100e, 3105
    preservation industry, 3269y
    research, 2108
  horticultural research, 4477
  medicinal plants, 583
  papaw growing, 1017n
  pyrethrum growing, 4049
  red pepper growing, 2870
  sugar cane growing, 3270i
  tannin plants, 1739
  tea growing and research, 999, 1016v, 3269x, 3246, 3254, 4427
  tobacco growing and varieties, 577b, 577e, 3961
  vegetable growing, 3105
Indian—
  agric. Res. Inst., A.R., 3300
  Coffee Bd, A.R., 3152
  gooseberry—*see Phyllanthus* spp.
  hemp—*see Cannabis sativa*
  Tea Ass., Tocklai, a guide to, 3245
  Tea Ass., Tocklai, A.R. and Proc., 2068
*Indigofera endecaphylla*, 4329
Indo-China—
  hevea research, 949, 4446 l
  medicinal plants, 1742p
  pepper growing and research, 615h, 1703
  plantation crops research, 1045
  ramie growing, 1725
  tea growing and research, 2066, 2067
Indoleacetic acid—*see* Growth substances
Indonesia—
  cacao growing, 1030, 4289
  coffee growing, 4323
  C.P.V. Exp. Stat., work at, 4272
  horticulture, 3107
Indonesia (*continued*)—
  plantation crops, 1076
  ramie growing, 1724
  rubber growing and research, 3193, 4447o
  tea growing, 4428
I.N.E.A.C.—*see* Institut national
Infrared radiation for soil heating, 65
Insect pests, parasites and predators of, 2545d
Insecticidal plants—
  derris, 4006
  *Haplophyton cimicidum*, 4068u
  *Mammea americana*, 4052
  pyrethrum—*see* Pyrethrum
  *Taxus baccata*, 611
  *Tripterygium wilfordii*, 4053
  of the U.S.A., 2868
Insecticides—*see also* Acaricides *and* Sprays *and individual pests and hosts*—
  aeroplane application, 4465
  aerosols, 1581, 1582, 2533, 3690t
  aldrin, 2499, 2650, 2653, 3690i, 3690k, 4411
  application in irrigation water, 2499
  arsenical—*see also below*, lead—
    injury to plants, 4453, 4483
    residues on plants, 2543
    residues in soil, 2544
  bees and, 1427, 3678
  BHC (benzene hexachloride)—*see also below*, lindane—
    DDT combined with, 2528
    flavour affected by, 425, 3682, 3996
    flavour not affected by, 3933, 3995
    plant growth responses to, 3995
    residual toxicity, 2546f
    residues on plants, 3681
    residues in soil, 2544, 3996, 4411
    for seed treatment, 1604, 1607, 3894
    soil application, 3643, 3996, 4411
    systemic action, 3955n
  biological—
    balance as affected by, 1421-1424
    control to supplement, 1877, 3650
    control upset by, 1876, 2520, 4240
  bis (dimethylamino) fluorophosphine oxide (dimefox, hanane), 916, 1956, 2103, 3132, 3901
  calcium cyanamide, 1522
  chlordane—*see also* Herbicides—1382, 2650, 3788, 3817, 4162j, 4411, 4412
  cryolite, 3651
  DDD, 3933
  DDT—
    activation of, 3659
    BHC combined with, 2528
    dusts, activated charcoal to reduce phytotoxicity of, 3831
    dusts, particle sizes in, 366
    injury to plants, 3817, 3831, 3996
    insects develop resistance to, 3659, 4483
    residues on plants, 330, 371, 2527
    residues in soil, 330, 2544, 3996
  demeton or systox (0,0-diethyl 0-(2-(ethylmercapto) ethyl) thionophosphate), 1426, 1427, 1523, 2494, 3685, 3689x, 4152

- Insecticides (*continued*)—
  - derris, 473
  - diatomaceous dusts, 2705
  - diazinon, 1430
  - dieldrin, 323, 2499, 2653, 3690k, 4162j
  - diethyl *p*-nitrophenyl phosphate (paraoxon), 3901
  - dusts, particle size determination in, 366
  - dusts, testing adhesiveness of, 1416
  - emulsions and suspensions compared, 365
  - endrin, 2653, 3676
  - 2-ethylmercaptoethanol compounds (E 1059), 1521
  - -fertilizer combinations, 1435g
  - fruit composition affected by, 3669, 4215
  - fruit set in cacao affected by, 4303
  - fungicides as, 1056
  - fungicides applied with, 247
  - granulated, 1520, 4162j
  - HCH—*see above*, BHC
  - heptachlor, 3788
  - lead arsenate, 370, 4215
  - lime-sulphur, 2521
  - lindane, 2653, 3681, 3689q, 3895
  - malath(i)on (S-(1,2-dicarbethoxyethyl) 0,0-dimethyl phosphonodithioate, 1431, 2524, 2542, 3690h
  - metasystox, 3677
  - 2-nitro-1,1-bis(p-chlorophenyl) propane+2-nitro-1,1-bis(p-chlorophenyl) butane (dilan), 2529
  - oil—
    - citrus quality affected by, 786, 4234, 4237
    - injury to plants, 1415
    - naphthenic and paraffinic fractions compared, 4232-4234
      - ovicidal action, 2521
    - parathion mixed with, 1871, 4235, 4236, 4261
  - OMPA—*see below*, schradan
  - ovicidal action, tests for, 2521, 2522
  - parathion—*see also* Acaricides—
    - action of, 4235
    - aphid resistance to, 2493
    - for citrus pests, 1871, 4235-4238
    - cuttings soaked in, 4046
    - flavour affected by, 1647g
    - injury to plants, 3817
    - oil combined with, 1871, 4235, 4236, 4261
    - ovicidal action, 2521
    - residues on plants, 2780, 3681, 3683, 3684, 3818, 3955g
  - pepper as, 2705
  - pestox—*see below*, schradan
  - phosphorus compounds, 1430, 1521, 2545t 4240
  - pollen germination affected by, 3130
  - residues determination, 2523, 2542, 3685, 3689m, 3690i, 3788
  - residues in soil, 2544, 2650, 4411
  - reviews on, 2519, 3287, 3293, 3668, 3689y, 3690n, 3690s
- Insecticides (*continued*)—
  - schradan *or* OMPA *or* pestox *or* sytam (bisdimethylaminophosphonous anhydride *or* octamethylpyrophosphoramide), 1426, 1523, 2525, 3689d, 3689x, 3901
  - seed treatment with—*see* Seed
  - sodium fluoroacetate, 3901
  - solvents for, 3675
  - suspensions and emulsions compared, 365
  - systemic—*see also* Acaricides, systemic—312, 797, 916, 1426, 1427, 1521, 1522, 1956, 2518, 2523, 2525, 3132, 3677, 3689d, 3689y, 3690n, 3955n, 4045
  - systox—*see above*, demeton
  - sytam—*see above*, schradan
  - toxaphene, 2650, 3996
  - toxicity to bees—*see above*, bees
  - toxicity to man, 1414, 2525, 2545t, 2546c, 3690k
  - for the tropics, 3293
  - for vegetables, 1647r, 2653
  - winter washes, 1432, 2522
- Institut(e)—
  - Encouragement Rech. sci. Ind. Agric. (I.R.S.I.A.), Brussels, A.R., 4473
  - Fruits Agrumes colon. (I.F.A.C.), plant collections, 3102
  - hort. Engng, Wageningen, work at, 1067
  - nat. Étude agron. Congo belge (I.N.E.A.C.), A.R., 834, 835
  - nat. Étude agron. Congo belge (I.N.E.A.C.), guide to, 3328
  - nat. Rech. agron., Paris, A.R., 1061i, 3301
  - Rech. Caoutchouc Indochine, A.R., 949
- Instruments—*see* Apparatus *and* Tools
- Inter-American agric. Conf., Proc., 4469
- International—
  - hort. Congr., London, Rep. 13th, 1061n
  - Potash Inst., Berne, work at, 4
  - Soc. Sugar Cane Technol., Proc. 8th Congr., 3196
- Iodine, radioactive, 3729
- Iodine sprays, disease prevention by, 2182, 2643
- Iodized storage wraps, 2383
- *Ipomoea*—
  - *hederacea*, control, 3745
  - *pulchella*, control, 2598
  - *pulchella*, varieties, 4079
- Ireland, Republic of, Minist. Agric., A.R., 3323i
- *Iridomyrmex humilis*, 1815, 4228
- Iris—*see also* Bulbs—
  - breeding, 4163j
  - bulb storage, 1770, 2963
  - diseases, 675
  - forcing, 674, 4111
  - growing in the U.S.A., 3011q
  - irrigation, 654
  - nutrition, 50
  - varieties, 4163j
- Iron—
  - deficiency—*see also below*, nutrition *and* sources—in fruit crops, 4453
  - deficiency, heavy metals induce, 2812

- Iron (*continued*)—
  - -manganese interrelationships, 2138
  - -molybdenum interrelationships, 2138, 3405
  - nutrition of—
    - apple, 1302, 2400, 2406
    - avocado, 744
    - azalea, 734, 2989, 4074
    - banana, 1923
    - bean, 41, 1117, 2147
    - cabbage, 1502
    - cacao, 867, 1952
    - cherry, 2400
    - citrus, 251, 774, 775, 1838, 3038-3040, 4198, 4200-4202
    - coffee, 908
    - deciduous fruit trees, 251
    - *Dracaena sanderiana*, 1802
    - gardenia, 2989
    - gladiolus, 668, 1502
    - hibiscus, 1502
    - lawn grasses, 2973
    - ornamentals, 252
    - pea, 2138
    - plum, 1302
    - rhododendron, 734
    - sub-tropical plants, 4274
    - tobacco, 41
    - tomato, 41, 2812
    - vine, 252
  - -phosphorus interrelationships, 1117
  - radioactive, 2147
  - sources, chelates, 708, 734, 744, 867, 1502, 1838, 2147, 2186, 3039, 3404, 4198, 4201, 4202, 4274
  - toxicity, 867
  - uptake and translocation, factors affecting, 1117, 2147
- Irradiation—*see* Gamma, Light *and* X-ray
- Irrigation—*see also* Soil moisture—
  - apricot, 162, 164, 4487
  - avocado, 4166
  - banana, 3116
  - bean, 164, 415, 1128, 1506, 2638
  - a book on, 3294
  - broccoli, 1128
  - bulbs, 654
  - cabbage, 1506
  - in Canada, 1203
  - castor bean, 2909
  - channels, weed control in, 2573, 2574, 3706
  - citrus, 164, 756, 764, 765, 1833, 4166, 4191, 4207, 4487
  - coconut, 4315
  - cucumber, 447, 1506, 2638
  - economics, 160, 2198
  - equipment, precision, for experimental purposes, 58
  - fertilizer application with, 59, 3317
  - for frost protection—*see* Frost protection
  - fruit tree, 160, 161, 163, 1203, 2196, 2639, 3513
  - furrow, 2639, 3513
  - glasshouse, 67, 68, 447, 3294
  - in North Africa, 163, 164, 765, 2196, 3513
- Irrigation (*continued*)—
  - olive, 163, 164, 4487
  - onion, 1506
  - pipe(s)—
    - concrete, 59
    - installation, 57
    - systems, 1145o
  - pot watering of seedlings in the field, 4315
  - requirements, calculation of, 161, 164, 764, 2377, 3421, 3918
  - research at Saanichton, B.C., 62, 3422
  - research at Sidi Tabet Exp. Stat., Tunisia, 4487
  - reviews on, 3420, 3421
  - with sewage water, 1131
  - sprinkler, 57, 60-62, 68, 160, 764, 1058, 1130, 2209a, 3294, 3422
  - strawberry, 3553, 4475
  - sub-, of pot plants, 2949
  - sugar cane, 4386, 4476
  - tea, 3257
  - tobacco, 164, 2850, 2909, 3978
  - tomato, 164, 415, 1128, 1506, 2638, 2814, 3918
  - in the U.S.A., 1129
  - vegetables, 414, 2639, 3294, 4489
  - vine, 1271, 2196, 2377
  - water, composition, 63, 4387
- Israel—
  - citrus growing, 4181
  - desert research, 3288
  - olive growing, 813
  - vine growing, 2346
- Italy—
  - almond growing, 237, 238
  - fig growing, 89
  - flower growing, 685, 2923, 2966
  - fruit growing, 87, 201f, 1019, 2220
  - fruit production and trade, 201r, 201x, 2219
  - fruit tree propagation material, 2239
  - globe artichoke growing, 2656
  - horticultural research, 1028
  - mulberry growing, 1152
  - mushroom growing, 2724
  - olive growing, 812, 1895, 1896
  - peach growing and varieties, 100, 1236c, 3284
  - plum growing, 1166
  - rose growing, 694
  - tobacco growing and research, 1656, 3960
  - vegetable growing, 543c
  - Villa Taranto, Lake Maggiore, 3323k
  - vine growing—*see* Vine growing *and* Vine varieties
- Ivy, poison, 3727
- Ivy rejuvenation by grafting, 2174
- *Ixora* spp., nutrition, 4274

- Jackfruit, flower biology, 4444
- Jamaica, Dep. Agric., investigations, 836
- Jamaica, sugar cane growing, 4446t
- Japan—
  - citrus growing, 3019
  - strawberry growing, 3549, 3768
  - vegetable growing, 3768

Japanese beetle (*Popillia japonica*), 1056
Jasmine, flower harvesting, 3002
Java—*see under* Indonesia
Jealott's Hill Res. Stat., guide to, 79p
*Jessenia bataua*, 1737
John Innes hort. Instn, A.R., 1041, 3302
Johnson grass—*see Sorghum halepense*
Jordan agric. Res. Serv., A.R., 4478
*Journal of the West African Institute for Oil Palm Research*, a new periodical, 1060
*Juglandicarya*, status of the genus, 1294
*Juglans*—*see also* Walnut—spp., wood anatomy, 2395s
Jugoslavia—*see* Yugoslavia
*Juncus effusus*, 3728
Jute as a medicinal plant, 4068f
Juvenile forms in plants, 125, 134, 1090, 2174, 3369

Kaki (*Diospyros kaki*)—*see* Persimmon
*Kalanchoë blossfeldiana*—
  composition, 1145c
  crown gall, 35
  photoperiodic response, 79f, 691, 692, 735e, 1145c, 2208q, 3443j
Kale—
  growing in New Zealand, 406
  nutritional value, 2137
  pollination, 543j
*Kalotermes simplicicornis*, 3065, 4264h
Kapok, water economy, 4030
Kapuskasing Domin. exp. Stat., Ont., Progr. Rep., 1042
Kashmir, essential oil plants, 4015
Kentville, Domin. exp. Stat., N.S., Progr. Rep., 1043
Kenya Coffee Bd, A.R., 4446u
Kenya Dep. Agric., A.R., 2119f, 3303
Kesteren hort. advis. Serv., Holland, A.R., 3304
Khellin from *Ammi visnaga*, 2873
Kiyaka Exp. Stat., Belgian Congo, work at, 3104
Kohlrabi—
  growing in New Zealand, 406
  mulching, 3775
  pollination, 543j
  water requirements, 2637
Kok-saghyz—
  growing in Spain, 2902
  latex formation and yield, 4057
  photo- and thermoperiodicity, 2903
  seed treatment, 1463
  tetraploid, 1742o
Kola, nut composition, 2074
Krilium—*see* Soil conditioners

Labour efficiency in horticulture, 7, 193, 201u, 543m, 1489, 1744, 1746, 2785, 3321
Labour efficiency in tropical agriculture, 3228
Labrador tea (*Ledum* spp.), 2920
*Laburnum*—
  *anagyroides*, 2984
  anatomy, cork membrane, 2208v
*Laburnum* (*continued*)—
  diseases, virus, 1807
  as a rootstock for *Cytisus*, 3004
  seed germination, 3003
*Lachnosterna* spp. on sugar cane, 4411
Lacombe Domin. exp. Stat., Alberta, Rep., 4474
*Lagerstroemia thorelli*, 4274
Lalang grass—*see Imperata*
*Lampetia equestris*—*see Merodon equestris*
"Lange Ossekampen" central manurial trial ground, A.R., 2119g
*Lantana camara*, 3697, 3746
*Laphygma frugiperda*, 1783
*Laspeyresia*—
  *molesta*—*see* Fruit moth, oriental
  *nigricana*, 472, 3851, 3852
  *pomonella*—*see* Codling moth
*Lathyrus aphaca*, 3719
Lausanne—*see also* Mont-Calme—Changins sur Nyon sub-station, experimental vineyard at, 1255
Lavender growing in France, 4022
Lavender hybrids, 4022
Lawn(s)—
  construction and care, 686, 1780
  diseases, 735u, 2975, 2976
  grasses—
    Bermuda-bentgrass mixtures, 1813u
    for dry conditions, 1813a
    establishment in old turf, 2972
    in Great Britain, 1779
    Merion bluegrass, 4123
    seed quality, 2924
    in the U.S.A., 1780, 1781, 2971, 4120
  growth substance effects, 2974
  management—
    aeration, mechanical, 4121
    a book on, 3277
    general, 686
    mowing, 4122
    mulching, 3416
    weed control, 394, 1470-1472, 2585-2589, 3721, 3759e
  nutrition, iron, 2973
  pests—
    *Antonina* spp., 687, 1784
    general, 1783-1785, 4162j
    nematodes, 4124
  re-establishment, 1782
Layering—
  air—*see* Marcotting
  apple, 3465
  cinchona, 4309
  walnuts, 2391
Lead, estimation, 2208f
Leaf(ves)—
  abscission—*see also* Defoliation—factors affecting, 23, 3005
  abscission layer, anatomy, 2981
  analysis—*see also individual plants*—
    figures, interpretation of, 39, 3778
    sampling for, 1950, 2374, 3433, 3514, 4203
    seasonal variations in, 145, 3035

Leaf(ves) (*continued*)—
  area, estimation, 3350
  area, petiolar xylem related to, 3353, 3354
  cuttings—*see* Cuttings
  development in lilac, 1813w
  moisture absorption by, 20
  movement in *Mimosa*, 2163
  pigments, 2139
  respiration, 1101
  smog markings on, 3588
  temperature, factors affecting, 2793
  transpiration—*see* Transpiration
Leafhoppers—*see also hosts and scientific names*—as virus vectors, 275, 1056, 1330, 2432, 2437, 2932, 3597, 3598, 3689s, 3785, 3836, 3864
Lebanon, citrus growing, 832c
*Lecanium pruinosum*, 2515
*Lecanium viride*, 1998
*Ledum* spp. as tea substitutes, 2920
Leek—
  seed production, 3769
  seed treatment, 3371
  taxonomy, 1593
  weed control, 2599
Legume(s)—*see also individual crops*—roots, response to growth substances, 34
Lemon—*see under* Citrus
Lemon grass—*see Cymbopogon*
Lentil growing in Algeria, 1567
Lentil seed vernalization, 462
*Lepadoretus compressus*, 880
Lepage's method of pruning and training fruit trees, 167
*Lepidechidna acharnias*, 3791
*Lepidosaphes beckii*, 3062, 3063, 4237-4239, 4264r
*Lepidosaphes ulmi*, 349, 1424, 3657
*Leptospermum* spp., control, 3736
*Leptothyrium coryli*, 1366
*Leptothyrium pomi*, 359, 1435f
*Lespedeza formosa*, 1807
Lethbridge exp. Stat., Alberta, Rep., 4475
Lettuce—
  breeding, 2773, 3764
  climate—
    air pollution damage, 45, 1083
    frost protection, 1314
    light, natural, 2166
    light, supplementary, 3430, 4480
    temperature responses, 2777
  composition, leaf, 2137, 2778, 3413, 3805, 3903
  composition, seed, 2775
  diseases—
    fungus—
      brown rot (*Sclerotinia sclerotiorum*), 2642
      mould (*Botrytis cinerea*), 1537
      leaf spot (*Pleospora herbarum*), 3905
    iodine treatment, 2182, 2643
    non-parasitic, 2774
    resistance, 1509, 2773
    virus, mosaic, 542b, 1647u, 3904
Lettuce (*continued*)—
  growing under glass, 1612
  growth substance responses, 2691, 4480
  herbicide injury, 2614
  hearts, temperatures in, 2779
  labour requirements, 1489
  leaf venation, 1613
  nutrition—
    carotene content affected by, 3413
    foliar, 2182, 2643
    manuring, 2137, 2778, 4480
    minor elements, 2182, 2643, 3805, 3903
  pests, 2773
  physiology, light responses, 2166, 3430, 4480
  physiology, photosynthesis, 2208 l
  research in the U.S.A., 2101
  seed—
    germination, biochemistry, 2775
    germination, factors affecting, 37, 416, 1614, 1615, 2173, 2632, 2633, 2776
    production, 3769
  seedlings, artificial light for, 3430
  soil management, rotations, 3773
  soil management, weed control, 1482, 3705
  spacing, 1612
  spray residues, 2780
  storage and transport, 2779
  varieties—
    in Denmark, 2627
    disease resistant, 2773
    in Holland, 4480
*Leucoptera coffeella*, 915, 1999
Levin Res. Stat., New Zealand, 1047
Liberia, cacao growing, 2078w
*Licania* spp. as oil plants, 841, 3278
Lichens—
  of Arizona and New Mexico, 2918
  chemical investigations, 615c
  control, 4433
  in the southern hemisphere, 4162 l
  tropical, 2917
Light—*see also* Photoperiodic—
  alkaloid synthesis affected by, 1709
  artificial—*see also* Forcing *and* Glasshouse illumination—
    for bulbs, 655
    for citrus, 3037
    for flower crops, 498, 1744, 2961, 3321, 4144, 4162v, 4480
    manuring of crops grown under, 3317
    for ornamental plants, 4073
    propagation under, 2169
    sources of, 1138, 2797, 2798, 3430
    for vegetable crops, 498, 499, 2797, 2798, 2802, 3430, 3827, 3886, 3911, 3912, 4480
  coloured, for fruit sorting, 1058
  coloured, plant growth affected by, 2169
  infra-red, horticultural uses of, 3336
  intensity—
    cacao response, 866
    carnation response, 1753
    citrus responses, 780, 3033, 3045
    coffee response, 1985, 3153

Light—intensity (*continued*)—
    cucumber response, 3430
    gladiolus response, 2961
    under glass and shade mats, 69
    lettuce response, 2166, 3430
    vine response, 2409
    tomato response, 3430
  leaf movement of mimosa affected by, 2163
  measurement, 1144, 2164
  phosphorus uptake affected by, 3911
  reflected, glass on soil increases, 2800
  seed germination affected by, 416, 444, 1614, 2162
  ultra-violet—
    for disease control, 3614
    horticultural uses of, 3336
    for smog detection on leaves, 3588
    for virus inactivation, 3810
  wave-lengths, photosynthesis affected by, 2208 l
Lignin, a soil conditioner, 2188
Lignite, growth promoted by, 3404
*Ligustrum*—*see also* Privet—
  *japonicum*, 258
  *ovalifolium*, 3005
  *vulgare*, 2985
Lilac—
  anatomy, 1813w
  composition, 2142, 3393
  diseases, 720, 3783
  pests, 2983
  seed testing, 3011n
  transpiration, 79z
*Lilium* spp. in the Balkans, 677
*Lilium speciosum album*, 680
Lily—
  breeding, 4490
  bulb characters, 676
  bulb storage, 679, 4490
  diseases and disorders, 680, 1057, 2965, 4113
  flower storage and packing, 621, 4489
  forcing, 678, 2964
  growing in Portugal, 4112
  mitosis, abnormal, 1773
  pests, insect, 3011i
  water—*see* Water lily
  *Year Book, R.H.S.*, 676
Lily-of-the-valley, flower packing and storage, 621, 4489
Lily-of-the-valley, forcing, 1774
Lime (*Citrus*)—*see under* Citrus
Lime (*Tilia*) propagation, 3304
Lime-sulphur—*see* Fungicides
Liming—*see also* Calcium—
  in British agriculture, 3279
  clay soils, 2282
  copper toxicity reduced by, 4200
  sandy dune soils, 50
*Limonium* spp. taxonomy, 735b
*Limonius* spp. control, 1688, 3871, 3955y
*Liriomyza langei*, 3954
*Liriomyza subpusilla*, 2836
*Listroderes obliquus*, 426, 1644
Litchi—
  floral biology, 4252
  nutrition, 4274
  pollination, 4252
  propagation by marcots, 4251
*Lithocolletis crataegella*, 372g, 1389
*Litsea zeylanica*, 615n
Locust tree—*see* Carob
Loganberry—
  diseases, 247, 1352
  mulching, 3416
  pests, 1352, 1381
*Lolium multiflorum*, 1780
Long Ashton agric. hort. Res. Stat., A.R., 1046
*Lonicera* sp., propagation by cuttings, 1796
*Lonicera tatarica*, 1211
Loquat pests, 1387
Loquat pollination, 4264y
Lotus (*Nelumbo nucifera*) diseases, 2977
Lucerne as a cover crop, 3030
Luddington exp. Hort. Stat., A.Rs and guides, 1064, 1147, 1527, 2107, 4479
*Lupinus albus*, 2142
Luxemburg, vine growing, 2346
*Lybindus dichrous*, 2020
Lycomarasmin, 3409, 3410
*Lygus lineolaris*, 1552
*Lymantria dispar*, 2507

Macadamia—
  growing in Hawaii, 809, 4265a
  a nut cracker for, 4254
  pruning and training, 810
  research in California, 1891
  varieties, 4253
*Macaranga monandra*, 4327
Macaulay Inst. Soil Res., A.R., 3305
McDonald's Corner Domin. hort. Substat., N.B., Rep., 3306
Machines and implements—*see also* Herbicides, equipment, Sprays, apparatus, *and* Tools—
  for coconut plantations, 4316
  for colour sorting fruit, 4489
  for compost preparation, 76, 3436
  conveyor belt for pricking out, 1499
  cultivating—*see also below*, sugar cane—2208j, 3436, 3509, 3572 l, 3572p
  farm, small implements, 72
  fumigation injectors—*see* Fumigation, soil
  for grading—*see also above*, colour sorting—
    cucumbers, 1058
    flowers, 625
    fruit, 1883, 3532, 3533, 4244
    tomatoes, 4489
  for grafting, 225, 3562, 4328
  for grubbing trees, 3436
  for harvesting—
    asparagus, 4489
    flowers, 3002
    hops, 2896, 4047
    onions, 480
    sugar cane, 978, 979, 2061, 3229, 3230

Machines and implements (*continued*)—
  hoes, power-operated, 2203, 3572 l
  horticultural, in Great Britain, 3321
  injection for liquid fertilizers, 151
  nursery, 79b
  for lawn aeration, 4121
  for planting—
    hevea, 4447b
    sugar cane, 3227
    trees, 3435, 3437
    tulips, 735w
    vegetables, 418
  pruning, 3031
  seed—
    cleaning, 3438
    disinfection, 422
    and insecticides mixing, 3686
    planting, 4490
    threshing, 1647s, 4056, 4061
  shovel for digging plant holes, 3437
  for shredding pruning wood, 1283
  for soil block making, 1139, 1141
  spraying—*see* Spray apparatus
  sugar cane—*see also above*, harvesting—978, 2039, 2047, 2079i
  for tea gardens, 1006, 3254, 3269z
  tractors, horticultural, 2208t
  for the tropics, 3108
  for vineyards, 230, 3572 l, 3572p
  for washing—
    coffee, 3164, 4334
    fruit, 536
    pots, 1142
    vegetables, 419, 420
  for weed control, 2554, 2555
*Maclura pomifera* (osage orange), 1741
*Macrophoma dalmatica*, 1905
*Macrophomina phaseoli*, 1579, 2760
*Macrosiphum pisi—see Acyrthosiphon pisum*
*Macrosporium carotae*, 1648f
*Macrosteles fascifrons*, 2932
Madagascar—
  cloud seeding, 2190
  Rech. agron., A.R., 4273
  sugar cane growing, 1016o
Madras, agric. Res., a review, 4476
Madras Dep. Agric., work of agric. Stats, A.R., 2108
Magnesium—
  determination, 3390, 3444b
  nutrition of—
    apple, 1210, 1435c, 2250, 2266, 2268, 2271, 2407, 3301
    banana, 849
    beet, 2763
    celery, 442
    cherry, 1303, 2273
    citrus, 769, 776, 2175, 4196, 4197
    filbert, 1057
    fruit crops, 246, 4453
    hop, 4043
    olive, 821
    peach, 2408
    pear, 1303
Magnesium—nutrition of (*continued*)—
    pecan, 256
    plum, 1303
    poinsettia, 722
    radish, 2175
    tung, 3095-3097
    vine, 255, 1304, 2546n, 3578
  role in photosynthesis, 3443u
*Magnolia*—
  *grandiflora*, 4154
  spp., hybrid, 4162g
  spp., propagation by marcotting, 1794
*Mahonia aquifolium*, 1808
*Mahonia* spp., propagation, 1794
Malaya—
  cacao growing and research, 1937
  coffee growing, 4323
  Dep. Agric., A.R., 1915
  flora, 2085
  Rubber Res. Inst., A.R., 947, 2021
  tea from, 841
Maleic hydrazide—*see* Growth substances *and* Herbicides
Malic acid, determination, 1087
*Mallotus philippinensis*, 1742j, 4068q
*Malpighia glabra*, 4267, 4274, 4446z
*Malpighia punicifolia*, 922, 1017 l
*Malus—see also* Apple breeding *and* Apple rootstocks—
  *floribunda*, 2545p
  *niedwetzkyana*, 4141
  *pumila*, 2545f
  spp., disease resistance, 2233, 2545f, 2545p
  spp., ornamental, 721, 4162a
  *sylvestris*, 4141
Malvaceae, diseases, 2987
*Mammea americana*, 4052
Mandarin—*see under* Citrus
Manganese—
  determination, 3443s
  nutrition of—
    apple, 2400
    cacao, 867
    citrus, 758, 1836, 1838, 1839, 3041, 4198
    fruit trees, 4453
    olive, 4256
    peach, 2400
    rose, 2980
    tea, 4437
    tomato, 1116, 1118, 2811, 3927
    tung, 3097
  radioactive, 1118
  toxicity, 774, 2138, 4198
*Mangifera* spp., origin, distribution and taxonomy, 2079a
Mango—
  breeding and selection, 4447p
  diseases, fungus, 2001
  flowers, sex of, 3173
  fruit set, factors affecting, 3173
  fruiting, biennial, 3172
  growing in British Guiana, 4268
  nutrition, a review, 4453
  pests, *Colaspis quattuordecimcostata*, 3639

- Mango (*continued*)—
  - pests, hopper (*Idiocerus* sp.), 924
  - products and by-products, 3300, 4447h
  - propagation by budding, 4349
  - propagation by grafting, 923
  - research in India, 4476
  - research in the U.S.A., 2101
  - rootstocks, 4267, 4349
  - storage, 925, 2001-2003
  - varieties, 3102, 4267, 4348, 4476
- Mangosteen—
  - composition, fruit, 4275
  - growing in Puerto Rico, 3268
  - seed germination, 3268
  - seed storage, 1014
- *Manihot* spp. in Brazil, 3278
- Manila hemp (*Musa textilis*)—
  - destruction with herbicides, 3746
  - diseases, fungus, 597, 2893
  - diseases, virus, 4032, 4033, 4068p
  - fibre extraction, 596
  - growing, a review, 595
  - pollination, 4031
  - seed germination, 4031
- Manuals on—
  - agricultural development in the dry tropics, 3278
  - brown rot of fruit trees, 3612
  - bulb growing, 3271
  - cacao, 1030, 3274
  - chrysanthemums, 1036, 1061a
  - cider apple production, 4451
  - diseases, nutritional, 3292
  - fertilizers, 3290
  - flower growing, 1061a, 4450
  - fruit growing, 1019, 1032, 2092, 3286, 4452
  - gardening, 1061a, 2084, 4456, 4494a
  - glasshouse pests, 1061 l
  - growth substances, 1018
  - house plants, 4494a
  - lawn craft, 3277, 4494a
  - liming, 3279
  - nursery practices, 4458
  - olive growing, 811, 4459
  - orchid culture, 3289
  - pest control, 2082, 3272, 3287
  - plant nutrition, 4453
  - plant physiology, 3273
  - pruning, 1027
  - roses, 1061a
  - seed testing, 1035
  - soilless culture, 2093
  - statistical design and analysis, 1021, 4460
  - storage, cold, of foods, 1236m
  - strawberries, 1034, 1243
  - sugar cane, 1020, 3285
  - sulphur and its uses, 4455
  - tomatoes, 4448
  - vegetable growing, 1029, 1032, 4457, 4494a
  - virus diseases and research, 2087, 3323n
  - viticulture, 1023, 2090
  - windbreaks, 2088
  - woodlands on farms, 2091
- Manuka (*Leptospermum* spp.) control, 3736
- Manure(s)—
  - foliar application of—*see* Nutrition, foliar
  - green—*see under* Cover crops
  - mulching with, 56
- Manuring—*see also* Fertilizers *and under particular crops and nutrients*—
  - with bacterial cultures, 1123
  - after floods, 1122
  - fruit crops—
    - by foliage sprays—*see* Nutrition, foliar
    - general, 1236d, 2208a, 2395b, 3539a, 4453
    - by soil injection, 151, 2275
  - with sewage sludge, 414
  - vegetables, 1047, 1501, 2208a, 2646, 3777
- Maple, sugar—*see* Sugar-maple
- *Marasmius perniciosus*, 878, 1016b, 3131
- *Marasmius stenophyllus*, 597
- Marcotting—
  - apple, 1174
  - breadfruit, 4267
  - cacao, 861
  - citrus, 4205
  - growth substances for, 1794, 4205
  - litchi, 4251
  - ornamentals, 1794, 1798
  - peach, 1174
  - plastic covers for, 201n, 1174, 1794, 1798, 2204, 2206
- Marigold tissue culture, 3374
- Marigold varieties, 4078, 4079
- Marketing—*see also* Packing
  - fruit, 80g, 83, 1232, 1233
  - research, 8
  - rubber, 2028
  - vegetables, 80g, 1646
- Marrow—*see also* Cucurbits *and* Squash—
  - planting, 2669
- *Marssonina juglandis*, 2482
- *Matthiola*—*see* Stock
- Mauritius—
  - Dep. Agric., A.R., 3307
  - sugar cane research, 3270b
  - sugarcane Res. Stat., A.R., 3199
  - Sugar Indust. Res. Inst., A.R., 4362
  - tea growing, 3252
- *Mechanisation*—*see also* Machines—*in horticulture*, a new periodical, 3321
- Medicinal plants—*see also* Alkaloids—
  - *Adonis vernalis*, 4068v
  - *Ammi visnaga*, 2873
  - apocynaceous, 2922b
  - *Artemisia caerulescens*, 2882
  - *Artemisia maritima*, 584, 615e
  - *Atropa belladonna*—*see Atropa*
  - in Bulgaria, 585
  - in Brazil, 4006
  - castor bean—*see* Castor bean
  - *Chenopodium ambrosioides*, 582
  - *cinchona*—*see Cinchona*
  - composition, factors affecting, 1708, 1709
  - *Corchorus olitorius*, 4068f
  - *Datura* spp.—*see Datura*
  - from desert regions, 2868, 3288
  - *Digitalis*—*see Digitalis*

Medicinal plants (*continued*)—
  *Duboisia* spp., 1713
  *Eucalyptus delegatensis*, 2875
  *Gentiana lutea*, 4008
  *Glycosmis arborea*, 1742d
  *Hamamelis virginiana*, 1716
  in Holland, 1647c
  *Hyoscyamus* spp.—*see Hyoscyamus*
  in India, 583
  in Indo-China, 1742p
  *Melissa officinalis*, 1715
  *Papaver somniferum*—*see* Poppy, opium
  *Piscidia erythrina*, 589
  *Rauwolfia* spp., 2878, 4012, 4068t, 4068y
  *Saponaria officinalis*, 4008
  *Schizandra chinensis*, 2871
  *Scopolia carniolica*, 1717
  soil fumigation benefits, 4007
  *Strophanthus* spp.—*see Strophanthus*
  *Strychnos* spp., 4014
  in the U.S.A., 2868
  *Valeriana officinalis*, 586
  in Yugoslavia, 1706, 4008
Mediterranean fruit fly—*see Ceratitis capitata*
Medlar, a review, 1236e
*Megaselia plurispinosa*, 2743
*Melanconium fuligineum*, 1363
*Melanconium lycopersici*, 527
*Melicocca bijuga*, 4267
*Melilotus indica*, 3719
*Meliola* sp. on sugar cane, 4421
*Melissa officinalis*, 1715
*Melittomma insulare*, 4319
*Meloidogyne*—
  *arenaria*, 541, 651
  *hapla*, 541
  *incognita*, 541, 1295f, 2702, 2829, 3945
  *javanica*, 541
  spp.—
    control, 1547
    on pistachio, 243
    on tobacco, 574
*Melolontha*—*see* Cockchafer
Melon (cantaloupe and musk)—*see also* Cucurbits—
  breeding, 3833
  composition, 1556, 3837
  diseases—
    fungus, 2678, 3837
    iodine treatment for, 2182
    virus, 3836
  fruit development, 1556
  growing in South Africa, 542n
  growing in the U.S.A., 542d, 3956n
  nutrition, 2182
  pests—
    insect, 456
    in Jamaica, 836
    mite, 1521
  pollination, 443, 3956a
  processing, juice, 3539k
  propagation by grafting, 1647t
  seedlings, raising of, 3772
  seedlings, soil blocks for, 1140
Melon (cantaloupe and musk) (*continued*)—
  soil management, fumigation, 4485
  soil management, weed control, 2610, 2612, 2613, 4485
  storage, 2383
  varieties, 2838e, 3308, 3832, 4480
  water—*see* Watermelon
*Mentha* spp.—*see* Mint
Mentor effect of grafts, 1175
*Merodon equestris*, 2967, 4114, 4115
*Mespilus* spp., as food plants, 2322e
Mesquite (*Prosopis juliflora*) control, 2580, 3730
*Metamasius hemipterus*, 1927
*Metanastria hyrtaca*, 3140
*Metatetranychus*—
  *citri*, 1912o, 3060, 4230, 4233, 4236, 4264s
  *ulmi*—
    climate affects, 2488
    control, biological, 310, 1424, 1435e, 3629
    control, chemical, 246, 311, 314, 1374, 1424, 1428, 1429, 1435e, 2485, 2486, 2489, 2492, 3626-3628, 3632, 3689b
    description of, 2487
    hatching of summer eggs, 3689v
    spray-resistant strains, 2486, 2546k, 4483
    sprays encourage, 290, 1374
Metaxenia in walnut, 2393
*Metrosideros umbellata*, 1742f
Michigan agric. Exp. Stat., A.R., 1061j, 4494f
Micro-climate—*see* Climate
*Microthyriella rubi*—*see Leptothyrium pomi*
*Mimosa pudica*, 2163
*Mimusops*—
  *elengi*, 2881
  spp. as rootstocks for sapodilla, 4445
  spp. yielding rubber and gutta percha, 4054
Mineral deficiency—*see* Deficiency, mineral
Mineral nutrition—*see* Nutrition, mineral
Minor element(s)—*see also particular elements and crops*—
  applications, excessive, 41
  deficiencies—
    enzymes affected by, 3443x
    injections to cure, 4196
    seed reserves affect, 466
    soilless culture for the study of, 47, 741, 867, 868
  in plant nutrition, 3403
  research in South Africa, 2399
  wilting toxins affect balance of, 3409
Mint (peppermint, spearmint and other *Mentha* spp.)—
  diseases, 1719, 4024, 4025, 4485
  growing in Argentina, 2922e
  growing in the U.S.S.R., 593
  oil, essential, 836, 2889, 4026
  pests, 4485
  species and varieties, 4023
Mississippi agric. Exp. Stat., A.R., 3308
Missouri agric. Exp. Stat., A.R., 3309
Mistletoe control, 1462, 3718
Mite(s)—*see also* Acaricides *and under crops and scientific names*—
  control, biological, 752, 2490, 4264s

- Mite(s) (*continued*)—
  - control on ornamental trees, 4162s
  - European red—*see Metatetranychus ulmi*
  - fruit tree red spider—*see Metatetranychus ulmi*
  - incidence, climate affects, 2488, 4230
  - incidence, host nutrition affects, 2651, 2670
- Mole control, 1785
- Molo hort. Stat., A.R.—*see under* Kenya Dep. Agric.
- Molybdenum—
  - absorption, soil reaction affects, 3805, 3807
  - deficiency in fruit crops, 4453
  - determination, 3389
  - nutrition of—
    - avocado, 777
    - beetroot, 3903
    - brassicas, 3805
    - carrot, 3903
    - cauliflower, 434, 1538, 3806, 3807, 3903, 3955s
    - citrus, 777, 1840, 3100s
    - legumes, 466, 3846
    - lettuce, 3805, 3903
    - parsley, 3903
    - tobacco, 3998, 4490
    - tomato, 1116, 3929
    - vegetables, 1508
  - phosphatases inhibited by, 3928
  - reviews on, 3405, 3406
  - toxicity to vegetables, 2138
- *Monarthropolpus buxi*, 4145
- *Monil(in)ia fructicola, M. fructigena, M. laxa, M. vaccinii-corymbosi—see Sclerotinia*
- *Monochaetia unicornis*, 2996
- *Monochaetia desmazierii*, 2480
- *Monohammus versteegi*, 3059
- Mont-Calme et Montagibert, Lausanne et Pully, Stats féd. Essais agric., A.R., 1044
- *Morchella hortensis*, 2715
- *Moringa pterygosperma*, 2922i
- Morning glory—*see Ipomoea pulchella*
- Morocco—*see also under* Africa, North—
  - horticultural research, 3444d
- Moss—
  - control in lawns, 2589
  - control on plants, 1991, 4433
  - for fruit and vegetable storage, 2322f
  - as graft protectant, 3004
- Mouse—*see under* Rodent
- *Mucor buntingii*, 4307
- *Mucor* spp. on tomato, 528
- Mulberry—
  - frost resistance, 2984
  - growing in Italy, 1152
  - pests, 3689g
  - propagation by cuttings, 1173
  - soil sickness, 258
  - soil waterlogging, 1323
- Mulch(ing)—
  - apple, 154, 1057, 1202
  - apricot, 2281
  - banana, 848, 4277
  - beans, 3774
- Mulch(ing) (*continued*)—
  - boysenberry, 55, 3416
  - bulbs, 55, 3416
  - cacao, 859, 865
  - carrot, 55, 3774
  - celeriac, 3775
  - cherry, 3416
  - coffee, 594, 1917, 3303, 4329
  - cucumber, 3774, 3775
  - fruit trees, 157
  - in Hawaii, 2077
  - kohl rabi, 3775
  - lawns, 3416
  - loganberry, 55, 3416
  - materials—
    - chaff, 56
    - corn cobs, 2338
    - fungi and bacteria on, 3512
    - hay, 55, 3416
    - manure, 56
    - paper, 3316
    - peat, 1202, 2330
    - prunings, chopped, 1058
    - sawdust, 55, 1569, 2330, 2338, 3295, 3416
    - straw, 2330, 3775
  - onions, 3316, 3774
  - papaws, 2009
  - peach, 159, 3416, 3511
  - pear, 1202, 2110, 3416
  - pyrethrum, 1917
  - raspberry, 196, 207
  - rose, 3416
  - soil aeration and root development improved by, 3775
  - soil nitrification affected by, 159
  - strawberry, 55, 207, 2330, 2338, 3416
  - sugar cane, 2064
  - tobacco, 1665
  - tomato, 55, 3774, 3775
  - vegetables, 55, 3295, 3416
- *Musa—see also* Banana *and* Manila hemp—
  - *acuminata*, 3110
  - *angustigemma*, 2079h
  - *enseta*, 1720
  - *erecta*, 2079h
  - *sinensis*, 2078k, 3112
  - spp., taxonomy, 1025
- Muscari diseases, 1813c
- Mushroom (*Psalliota* and other spp.)—
  - bed casing, 1588, 1589, 2726, 2728, 2733-2735, 3872
  - composition, 2737
  - composts, types, 1057, 2719, 2722, 2730-2732, 3955c
  - diseases—*see also below*, truffle—2739, 3872, 3874
  - growing—
    - in Belgium, 2716
    - in Denmark, 2717
    - in France, 2718, 2720, 3873
    - in Germany, 2721
    - in Great Britain, 2727
    - in Holland, 2723
    - in Italy, 2724

Mushroom—growing (*continued*)—
      a manual on, 1031
      in Poland, 3955h
      a review on, 2714
      tray system, 2720
      in the U.S.A., 3955c
      in water culture, 2715
   growth substance responses, 1590
   harvesting, 1588, 2728
   house, air conditioning and ventilation, 1778, 2725, 2838b, 4490
   house, heating, 2728
   nutrition, nitrogen, 2736
   nutrition, organic acids, 2738
   pests, insect, 2743, 3875
   pests, nematode, 474, 2740-2742
   processing, 408
   research—
      in France, 3301
      Proc. 2nd int. Conf. on, 2710
      at Yaxley, Peterborough, 2729, 3872
   soil sterilization, 3872
   spore germination, 2838h
   strains, deterioration, 2713
   taxonomy, 2711
   truffle control, 2838g
Mustard nutrition, 3404
Mustard vernalization, 3358
*Mycorrhiza*—
   of *Allium* and *Solanum* spp., 2838w
   of fruit plants, 3355
   of hevea, 3187
   a review on, 3443z
*Mycosphaera alni*, 2481
*Mycosphaerella*—
   *caryigena*, 2481
   *citrullina*, 452
   *dendroides*, 2481
   *pinodes*, 2700
*Myrciaria cauliflora*, 4274
*Myrica carolinensis*, 4141
*Myristica fragrans*, 592
Myrobalan—
   as a plum rootstock, 126
   propagation, 125
   seed germination, 2240
*Myzodes persicae—see Myzus persicae*
*Myzus*—
   *ascalonicus*, 2761
   *persicae*, 1377, 1521, 2854, 3810, 3936, 4083
   *solani*, 372t

Naaldwijk Res. Stat. Fruit Veg. Cult. under Glass, A.R., 4480
*Najas pectinata*, 2572
*Napaea dioica*, 4068r
Narcissus—*see also* Bulbs—
   breeding, 2956
   bulb sterilization, 2967
   cytology, 3372
   forcing, 655
   irrigation, 654
   pests, insect, 682, 2967, 4114, 4115
   pests, nematode, 683

Narcissus (*continued*)—
   *tazetta* var. *orientalis*, 1774
   weed control, 392, 1469
   *Year Book, R.H.S.*, 681
Nastic movements, a review on, 3364
Nasturtium seed oil, 1295c
Natal agric. Res. Inst., A.R., 3316
National Inst. agric. Botany, Cambridge, A.R. and guide, 4481
Nectar—
   glands of *Nepenthes*, 4163a
   secretion, 1127, 3414, 3424
   sugar content, 16, 3492, 3541
Nectarine—
   diseases, 3595
   origin, 2235
   pests, 327
   sport on peach, 2236
   storage, 2319
   varieties, 1159
*Nectria galligena*, 372u, 1336
*Nectria* sp. on tea, 3261
*Nelumbo nucifera*, 2977
*Nelumbo* spp. as food plants, 693
Nematode(s)—
   apple, 1368, 3445, 3581
   avocado, 3016
   bean, 2702
   beetroot, 3893
   black currant, 372i
   boxwood, 4146
   bulb, 1776
   capsicum, 541, 2648
   carrot, 1519, 3892, 3893
   celery, 1519, 1547, 1549
   chrysanthemum, 648
   citrus—*see* Citrus pests
   coconut, 896, 897
   in compost, 423
   control—
      by BHC, 3996
      biological, 2830, 3066
      by D-D, 2647, 3418, 3945, 4226
      by ethylene dibromide, 1519, 2647, 3418, 3892, 3945
      by hot-water treatment, 1370, 3885
      by methyl bromide, 1445
      reviews on, 248
      by root fumigation, 3893
      by systemic insecticides, 648, 649, 897, 4152
      testing nematocides for, 2545r
      in the U.S.A., 1376
   cucumber, 2647, 2648, 2829
   dahlia, 662
   delphinium, 1759
   fern, 648
   fig, 2484
   garlic, 2838r
   in horticultural plants, 1435m
   hydrangea, 3001
   lawn, 4124
   loganberry, 1352
   mushroom, 474, 2740-2742
   narcissus, 683

Nematode(s) (*continued*)—
  okra, 3945
  onion or shallot, 1519, 3885
  parsnip, 1519
  phlox, 649
  pineapple, 3185
  pistachio, 243
  root anatomy affected by, 2645
  rose, 4135
  saintpaulia, 651
  strawberry—*see* Strawberry pests
  sugar cane, 995
  teasel, 2921
  tobacco—*see* Tobacco pests
  tomato—*see* Tomato pests
  vine, 1295f
*Neoglaziovia variegata*, 3278
*Neoleucinodes elegantalis*, 3946
*Neorhizoecus* (*Rhizoecus*) *coffeae*, 4345
*Nepenthes* glands, histology of, 4163a
*Nephantis serinopa*, 899, 1017g, 4318
Nerine growing in Italy, 2966
Netherlands—*see* Holland
Nettle control, 1479
New Caledonia, agriculture, 1077
New Caledonia, coffee growing, 3165
*New Guinea Agricultural Gazette, Papua and*, a revived periodical, 2116
New Guinea, cacao growing, 1973
New Hebrides, diseases of plantation crops, 3148
New South Wales—*see also under* Australia—
  Dep. Agric., A.R., 4482
New York St. agric. Exp. Stat., A.R., 4483
New Zealand—
  Commercial Gardeners Ltd. annu. Mtg, Rep., 2119c
  Dep. Agric., Hort. Div., A.R., 1047
  D.S.I.R., A.R., 2099
  ferns, tree, 4160
  flax (hemp)—*see Phormium*
  fruit growing, 2120
  spinach (*Tetragonia expansa*), 2744, 3956f
  tobacco growing and research, 1697a, 1697n
  vegetable growing, 406, 1609, 2120
*Nezara viridula*, 382, 3697
Niacin, light activates, 3913
Nickel determination, 12
Nickel in vegetable nutrition, 2813
*Nicotiana*—
  *glauca*, 409, 2843
  *glutinosa*, 3866, 3986
  *rustica*, 554, 577e, 1103, 1655, 1674
  *sylvestris*, 2843
  *tabacum*—*see* Tobacco
Nicotine—*see* Tobacco composition *and* physiology
Nicotinic acid biosynthesis, 2792
Nigeria—
  agric. Dep., A.R., 4269
  cacao growing and research, 4286
  fibre plants, 1720
  gardening, 2084
*Nilotaspis halli*, 1398
Nitrate determination, 2136, 3444c
Nitrate formation in soil, 2644
Nitrite toxicity to plants, 3402
Nitrogen—*see also* Urea *and separate crops under* nutrition—
  absorption by plants, 4194
  assimilation, symbiotic, in non-leguminous plants, 80b
  deficiency—*see particular crops under* nutrition
  determination, 1691, 2143
  dioxide, plants injured by, 2414
  metabolism in plants, 3391, 3515
  nutrition, transpiration affected by, 2184
  nutrition of vegetables, 2640
  radioactive, 771, 3974
  requirements, a test for, 3507
Nomenclature—
  botanical, 2094
  growth substances, 3375
  horticultural, 1145g, 1145h, 3349
  tea tasting, 4446s
North Africa—*see* Africa, North
Northern Rhodesia—*see* Rhodesia, Northern
Norway—
  fruit growing, 2395h, 3539p
  nurseries, 106
  strawberry growing, 1247
  tomato growing, 1623
Nucleic acid, growth substances affect, 36
Nursery(ies)—
  in Brazil, 3444e
  machinery, 79b, 2208j
  in Norway, 106
  pests, 3641
  practices, a book on, 4458
  soil sickness in, 1307
  statistics, international, 105
  stock, chemical defoliation, 1813k
  weed control in, 1908, 2568, 2581, 2584, 2591, 2597, 3740
Nut(s)—*see also individual species*—
  composition, 1236g
  diseases in the U.S.A., 3291
  growing in the U.S.A., 1236p
  nutrition, a review, 4453
  shells, uses of, 2321
  trade, 2111
  varieties, a list of, 10
Nutgrass—*see Cyperus* spp.
Nutmeg (*Myristica fragrans*) leaf oil, 592
Nutrients, transport to buds, 2208e
Nutrition (plant)—*see also individual plants under* nutrition—
  chelating agents in—*see also* Iron sources—3408, 4453
  foliar—*see also* Urea—
    of apple, 148, 2276, 2277, 3502
    of bean, 2176, 2636
    of beetroot, 3702
    of brussels sprouts, 2636
    of cabbage, 3802
    of cacao—*see* Cacao nutrition
    with calcium, 517, 1546, 2962

- Nutrition (plant)—foliar (*continued*)—
  - of celery, 1546
  - of citrus, 1836, 4196, 4215
  - of cucumber, 3827
  - disease resistance enhanced by, 1298
  - of fruit crops, 1049, 3412, 3502
  - fungicides and insecticides combined with, 1647r
  - of gladiolus, 2962, 4105
  - with iodine, 2182, 2643
  - of pear, 2272, 2403
  - with phosphatic compounds, 3412
  - reviews on, 1052, 3411
  - of strawberry, 2342
  - with sucrose, 504, 2805
  - of sugar cane, 3214
  - of tobacco, 3974
  - of tomato—*see* Tomato nutrition
  - of vegetables, 1647r
  - of vine, 1305, 2410
  - of fruit crops, a manual on, 4453
  - by injection, 867, 1909
  - minor elements in, 3403
  - radioactive isotopes used in—*see* Radioactive
  - reviews on, 80e, 3400, 3444 l
- Nutritional studies, tracheal sap extracted for, 1207
- Nutritional value of produce in relation to manuring, 2137
- *Nux-vomica—see Strychnos*
- Nyasaland, crop production, 4486
- Nyasaland Dep. Agric., A.R., 3251, 3310, 3323 l
- *Nyctanthes arboristes*, 2881
- *Nymphaea* spp. as food plants, 693

- Oak propagation by grafting, 1809, 3304
- Oak species, eradication of, 2577
- *Ocimum kilimandscharicum*, 2890
- *Odonaspis ruthae*, 1784
- *Oecophylla longinoda*, 3147, 4320
- *Oecophylla smaragdina*, 843, 1918, 2103
- *Oedaleus* spp. as fruit pests, 3660
- *Oenospila flavifusata*, 3140
- *Oenothera organensis*, 3451
- Oeschberg pruning method, 168
- *Oidium heveae*, 959
- Oil(s) (vegetable)—*see also* Essential—
  - *Balanites aegyptiaca*, 2904
  - candlenut (*Aleurites moluccana*), 841
  - castor—*see* Castor
  - coconut, 1050, 1675, 1977
  - extraction methods, 1977
  - filbert, 1295c
  - kamala (*Mallotus philippinensis*), 1742j, 4068q
  - nasturtium, 1295c
  - olive, 2100
  - palm, *Elaeis* spp.—*see Elaeis*
  - palm, *Jessenia bataua*, 1737
  - pecan, 2904
  - plants—*see also* Essential—
    - castor bean—*see* Castor

- Oil(s) (vegetable)—plants (*continued*)—
    - *Clitoria ternatea*, 4062
    - *Cnidosculos phytacanthus*, 3278
    - cucurbits, 2868, 2916
    - *Entada phaseoloides*, 4062
    - *Guizotia abyssinica*, 1050
    - *Licania* spp., 841, 3278
    - okra—*see* Okra
    - olive—*see* Olive
    - poppy, 4068m
    - safflower—*see* Safflower
    - *Shorea* sp., 4068h
    - tung—*see* Tung
    - of the U.S.A., 2868
    - *Xanthium italicum*, 612
    - *Ximenia* spp., 4068n
  - pomegranate seed, 2322a
  - production and trade, world, 2100
  - tobacco seed, 4003b
  - ucuuba (*Virola* sp.), 1738
- Okitsu hort. Exp. Stat., work at, 5
- Okra (*Hibiscus esculentus*)—
  - diseases, 1592
  - flower and fruit development, 2746
  - growing in the U.S.A., 3956p
  - pests, 3945
  - pollination, 2746
  - seed germination, 2745
- *Oliarus atkinsoni*, 4035
- Olive—
  - bibliography, 1892
  - by-products, 1906
  - cement dust affects, 819
  - climate, chilling requirements, 3080
  - climate, frost resistance, 4264m
  - composition, leaf, 820, 821, 1900
  - diseases—
    - cause uncertain, leptonecrosis, 1902
    - fungus—
      - *Alternaria tenuis*, 3083
      - anthracnose (*Gloeosporium olivarum*), 4257
      - cercosporiosis (*Cercospora cladosporioides*), 1904
      - leaf spot (*Cycloconium oleaginum*), 3084, 3085
      - *Macrophoma dalmatica*, 1905
      - *Septoriella oleae*, 1905
    - in Portugal, 1912g
    - virus, 1903
  - economics, 822
  - flower bud differentiation, 1898, 3080
  - fruiting, biennial, 1901
  - growing in—
    - Israel, 813
    - Italy, 812, 1895, 1896, 4459
    - Morocco, 814, 3100c, 4264i
    - Spain, 1893, 4265e
    - Syria, 1894
    - Tunisia, 3077, 4487
    - the U.S.A., 811
  - harvesting, 822
  - leaf—
    - composition, 820, 821, 1900

Olive—leaf (*continued*)—
    malformation, 1902
    morphology and anatomy, 1912b, 3100d
  manuals on, 811, 4459
  nutrition—*see also below*, soil management—
    boron, 253
    manganese, 4256
    mineral deficiency studies, 821
    nitrogen, 820, 1900
    phosphorus, 820
  oil production and trade, 1893, 2100
  pests—
    fly (*Dacus oleae*), 323, 823-825, 832h, 2531, 3087, 3088, 4258-4260
    midge (*Dasyneura* (*Perrisia*) *oleae*), 826, 3089
    *Phloeotribus scarabeoides*, 3090
    scale (*Parlatoria oleae*), 827, 4261, 4262
    scale (*Pollinia pollini*), 4264b
  pollen characters, 816
  pollination, 128, 817-819, 832s, 3081, 3082, 3338
  preservation of green, 832q
  propagation by cuttings, 3078, 3079
  pruning and training, 1901
  research in Tunisia, 3077
  root system, 781
  seed germination, 1897
  soil management, irrigation, 163, 164, 4487
  sterility, 1899, 3082
  varieties, 812-816, 823, 1894-1896, 4255, 4264m, 4487
*Omphalia flavida*, 914, 2151, 3166
Onion—
  bolting, 477, 2749, 3876
  breeding and selection, 3763
  bulb—
    dormancy prolonged by growth substances, 481, 2754, 3880
    formation, factors affecting, 475, 3876
    storage, 481, 482, 1596, 1601, 1778, 2749, 2751, 3699, 3880
  composition, 543i
  diseases—
    fungus—
      downy mildew (*Peronospora destructor*), 2756, 3881-3883
      neck rot and blast or leaf spot (*Botrytis* spp.), 478, 543k, 2757
      smut (*Urocystis cepulae*), 479, 1520, 1598, 2113, 2755
    resistance, 1509
  growing in—
    Costa Rica, 542u
    France, 3878
    Peru, 3955j
  growth, tillering, 476
  harvesting, mechanical, 480
  nutrition—
    manuring, 1595
    nitrogen, 2640
    salt tolerance, 2413, 2753
  pest(s)—
    *Ceuthorhynchus suturalis*, 3955v, 3956h

Onion—pest(s) (*continued*)—
    control, insecticides for, 479
    control in New Zealand, 542p
    *Dizygomyca cepae*, 2838t
    flies (*Delia* and *Eumerus* spp.), 1520, 1544, 1599, 1600, 2113, 2759, 3956d
    nematodes, 1519
    thrips, 2758, 3884
  physiology, phosphorus translocation, 3879
  physiology, photoperiodic and temperature responses, 475
  phytoncides from, 542h
  pollen sterility in, 2752
  research in South Africa, 2622
  seed—
    germination, 2632
    production, 1594, 2750
    rates, 2748
    sowing time, 475, 3876
    treatment, 1599
  soil management—
    irrigation, 1506
    mulching, 3316, 3774
    rotations, 3773
    weed control, 400, 1482, 1485j, 2558, 2599, 2615, 2616, 3753
  spacing, 1533, 2747, 3770
  spray residues, 3788
  storage—*see above*, bulb
  transplanting, 3772
  varieties, 3760, 3763, 3877, 3955w, 4478
*Oospora citri aurantii*, 3073
*Operophtera brumata*, 1394, 2522
Opheusden Tree and Fruit Inst., Netherlands, A.R., 3304
*Ophiostoma coffeae*, 1993
*Opuntia megacantha* control, 1485k
*Opuntia* spp. utilization in the U.S.A., 2868
Orange—*see under* Citrus
Orchard(s)—*see also* Fruit—
  cover crops—*see* Cover crops
  lay-out, 3539o
  soil management—*see also under individual crops*—157, 3436, 3509, 3539a, 3539t
  weed control—*see also individual crops under* soil management *and also* Weeds—404c, 2590, 2597
Orchid(s)—
  diseases, fungus, 690
  diseases, virus, 3011u, 4163 l
  growing, a book on, 3289
  pests, mite, 4127
  pests, snail, 735g
  research in Belgium, 618
  root histology, 689
  soil mixtures for, 4125
  species, distribution, 688
  species, Guatemalan, 2080
  watering, 2927, 4126
Ornamental(s)—
  coniferous—*see also below*, woody, *and individual species*—
    in Argentina, 1813b
    diseases, 2996

Ornamental(s)—coniferous (*continued*)—
    propagation, 1812
    pruning, 1793, 3011l
    in the U.S.S.R., 4140
  evergreen, pests, 710
  plants—*see also below*, woody—
    breeding, 1813o
    climbing, 4162d
    diseases, 3291
    frost injury, 2418
    light needs and responses, 2169, 4073
    nutrition, phosphorus, 2185
    pests, 626, 1750, 4077
    propagation, 705, 2169, 2170
    research in Belgium, 618
    soilless culture, 4075
    trade, 2127
    in the U.S.A., 1747
  woody—*see also above*, coniferous *and* plants *and individual plants and* Trees—
    in Canada, 1042, 1048
    chlorosis, lime-induced, in, 708
    for desert areas, 4137
    diseases, 2448, 4150, 4162t
    dwarfing methods for, 1792
    flooding injuries, 3011e
    fruit formation, sprays to prevent, 4142
    fumigation, 709
    fungicides for, 4162c
    in Great Britain, 735k
    for hedges, 1791
    herbicide injury to, 393, 2584
    in Hong Kong, 1813g
    pest control, 1813n, 2986, 4162s
    propagation, 1795-1797, 1799, 2926
    pruning, 1027, 1793
    as shade trees, 735h
    soil pH requirements, 706
    trade, 2127
    in the U.S.A., 4138
    winter hardiness, 735k, 2984
    wound treatment, 2448
*Orobanche ramosa*, 402, 2827, 3758
*Oryctes rhinoceros*, 898, 1017g, 1976, 3149, 4318
Osmotic pressure, frost resistance related to, 1757
Osmotic pressure, rooting of vine cuttings affected by, 2364
*Otiorrhynchus crataegi* and *O. ligustici*, 2983
*Ovulinia azaleae*, 4159
Oxalic acid, determination in plants, 13, 3780, 3907
Oxalic acid, metabolism in plants, 4099
*Oxystigma oxyphyllum*, 4065

*Pachyzancla phaeopteralis*, 1783
Packing—*see also* Grading *and individual crops*—
  containers—
    for apples, 1232, 2313
    bags (packages) for vegetables, 487
    bulk, for citrus and other fruits, 9
    for fruit, general, 192, 1231, 2322j, 3539b
    plastic liners for, 1227
Packing (*continued*)—
  films, insect-proof, 3661
  fruit, bulk handling for, 800
  fruit, general methods, 191
  house construction and layout, 800
  house equipment, 3321
  methods in the U.S.A., 2208b
  plants, plastic film for, 2204
  sampling procedures, 2134
  vegetables, 487, 535
Paeony—*see* Peony
Pakistan—
  date growing, 4250
  essential oil plants, 2880
  fruit growing and varieties, 2124
  mango growing, 4348
  sugar cane growing, 3203, 3204
  vegetable research, 1486
*Palaquium* spp., sources of gutta-percha, 3194, 4054
Palermo Inst. Vine and Wine, work at, 3556
Palm oil—*see Elaeis*, palm oil
Palmira agric. exp. Stat., A.R., 3311
*Pantomorus godmani*, 4176
Papain—*see* Papaw products
*Papaver somniferum*—*see* Poppy, opium
Papaveraceae, classification, 2876
Papaw (*Carica papaya*)—
  breeding and genetics, 4353
  composition, 4446p
  diseases, fungus, 940
  diseases, a review, 939
  fruit—
    fumigant residues in, 844
    parthenocarpic, 2011
    respiration, 3518
  fruiting failure, factors causing, 2010
  growing—
    in Angola, 3299
    in Australia, 2008
    in India, 1017n
    indoors, 4354
    in South Africa, 1017c
    in Tanganyika, 2007
  mountain (*Carica candamarcensis*), 3181
  planting methods compared, 2009
  polyploidy, colchicine induced, 1017o
  products, papain, 842, 2007
  rootstocks, 3181
  seed germination, viviparous, 3180
  soil management, mulching, 2009
  transport, 427
  varieties, 3269u, 4267
Paprika—*see under Capsicum*
Papua and New Guinea—
  *Agricultural Gazette*, 2116
  coconut growing, 888, 1973
  tea growing, 2069, 3253
*Paratetranychus*—*see also* Mites—
  *citri*—*see Metatetranychus citri*
  *ilicis*, 710, 4148
  *pilosus*—*see Metatetranychus ulmi*
*Paratoxoptera argentinensis*, 1868
*Paratylenchus* sp. on celery, 1549

- *Paratylenchus* sp. on loganberry, 1352
- *Parkia filicoidea*, 841
- *Parlatoria*—
  - *oleae*, 827, 4261, 4262
  - *pergandei*, 4264r
  - *ziziphi*, 4239, 4264r
- *Parmelia* sp., chemistry, 615c
- *Parrotia* sp., propagation, 1794
- Parsley—
  - nutrition, 3903
  - varieties, 3955f
  - weed control, 3754
- Parsnip—
  - frost resistance, 489
  - pests, nematode, 1519
  - weed control, 2599
- *Parthenium argentatum*—*see* Guayule
- Parthenocarpy—
  - induced in—
    - papaw, 2011
    - pumpkin, 2916
    - *Petunia*, 1762
    - tomato—*see* Tomato fruit set
  - natural, in cacao, 4302
  - natural, in tomato, 1619
- *Parthenocissus vitacea*, 2168
- *Paspalum dilatatum*, 3718
- Passion-fruit—
  - diseases, virus, 829
  - growing—
    - in Hawaii, 4263
    - in New Zealand, 1047
    - in South Africa, 1907
  - packing, 3091
  - pests, 3100m
  - pruning, 828
  - seedling variation, 828
  - storage, 2383
- *Pastinaca sativa*, 376
- Patents for new plant varieties, 2208u
- Pea—
  - breeding and genetics, 1510, 3842, 3955r
  - composition, plant, 80d
  - composition, seed and pod, 465, 1571, 3392
  - diseases—
    - fungus—
      - *Cylindrosporium pisi*, 1578
      - foot or root rot, or wilt (*Fusarium* spp.), 457, 2699, 2700
      - leaf and pod spot and blight or foot rot (*Ascochyta* and *Mycosphaerella* spp.), 1510, 1577, 1578, 2698, 2701
      - root rot, 1580
    - varietal resistance, 457, 1509
    - virus, 457, 3848, 3849
  - graft hybrids, 1562
  - growth—
    - genetics of, 3955r
    - growth substances affect, 32, 464, 1576, 2152, 3922
    - phase, vegetative, measurement, 2685
    - shoot asymmetry, 1568
  - harvesting, 1586
  - leaf, nutrient recretion by, 2181

- Pea (*continued*)—
  - maturity—*see below under* quality
  - mutations, 1563, 3842
  - nutrition—
    - liming, 2113, 3847
    - manuring, 414, 2690, 3847
    - minor element, 466, 2138, 3846, 3847
  - pests—
    - aphid (*Acyrthosiphon pisum*=*Macrosiphum pisi*), 1056, 1581, 1582, 2113, 3849, 3850
    - army worms (*Prodenia* and *Persectania* spp.), 2655, 2708
    - control, general, 542p
    - corn earworm (*Heliothis armigera*), 2655
    - lesser cornstalk borer (*Elasmopalpus lignosellus*), 2709
    - midge (*Contarinia pisi*), 3854
    - moth (*Laspeyresia* (*Enarmonia*) *nigricana*), 472, 3851-3853
    - thrips, 542z
    - weevils (*Bruchus*, *Sitona* spp., etc.), 542 l, 2706, 3956c, 4483
  - physiology—
    - enzyme activity, 3384
    - light responses, 29, 3844, 3910
    - respiration, 2167
    - temperature responses, 3843, 3845
    - tryptophan oxidation, 1648i
  - pollination, 2684, 3843
  - processing, preservation, 408
  - quality, factors affecting, 1052
  - quality, measurement, 468, 1586, 1587, 4475
  - roots, growth-inhibitor from, 2152
  - roots, nodule bacteria, virus destroys, 3955t
  - seed—
    - germination, 461, 2688
    - production, 1047, 2684, 2838x
    - testing, 1570
    - treatment, vernalization, 3358, 3845
    - weight, 1587
  - soil management, weed control, 404d, 1479, 2558, 2561, 2599, 2617, 2621f, 3756, 3757
  - southern—*see Vigna sinensis*
  - storage of green, 2635
  - sweet—*see* Sweet pea
  - tissue cultures, 2140, 2152
  - varieties, 408, 457, 542s, 1561, 1564-1566, 1647m, 2679, 3956 l
- Peach—
  - anatomy, fruit, 2322 l
  - antibiotics affect, 357
  - blossom, abnormal, 3489
  - blossoming retarded by sprays, 1198
  - breeding, 1153, 3284
  - climate—
    - atmospheric pollution, 2414
    - temperature response of fruit, 201m
    - winter chilling requirements, 2216
    - winter injury, 150, 3587
  - composition, fruit, 1211, 1215, 2302
  - composition, leaf, 39, 1208, 2408

- Peach (*continued*)—
  - diseases—
    - bacterial—
      - bacterial spot (*Xanthomonas pruni*), 281, 282, 357, 372a
      - blast (*Pseudomonas syringae*), 298, 3664, 3665
      - shot hole or gum spot (*Clasterosporium carpophilum*=*Coryneum beijerinckii*), 2466
    - cause uncertain, allophylly, 1310
    - cause uncertain, leptonecrosis, 1301
    - fungus—
      - anthracnose (*Gloeosporium laeticolor*), 297, 4490
      - brown rot and blossom blight (*Sclerotinia* (*Monilia*) spp.), 294, 1300, 1347, 2464, 3511, 3615
      - canker (*Fusicoccum amygdalis*), 2463
      - canker (*Nectria galligena*), 372u
      - fruit rot (*Diplodina persicae*), 2462
      - phytophthora rot (*Phytophthora cactorum*), 1345
      - *Rhizopus nigricans*, 294, 3615
      - root rot (*Phytophthora megasperma* and *Clitocybe tabescens*), 2461, 3616, 4489
      - scab or freckle (*Fusicladium* (=*Cladosporium*) *carpophilum*), 1341, 2465
      - silver leaf (*Stereum purpureum*), 373b
    - non-parasitic, chlorosis and necrosis, 2408
    - non-parasitic, silver leaf, 1317
    - storage rots, 3673
    - virus—
      - eastern X-disease, 3596
      - moorpark-mottle, 3594
      - mosaic, 273, 1329, 3690u, 3690v
      - necrotic leaf spot, 3595
      - phony disease, 1056, 1331
      - western X-disease, 274
      - yellow leaf roll and buckskin, 1330, 3690q
  - dormancy, DNC breaks, 2216
  - fruit—
    - anatomy, 2322l
    - browning, enzymic, 1216
    - colour, factors affecting, 1206, 2274
    - composition, 1211, 1215, 2302
    - development, temperature affects, 201m
    - flavour, insecticides affect, 3682
    - respiration, 3518
    - ripening, growth substances affect, 184, 2216, 3499
    - set under glass, 64
    - thinning, 176, 3497, 4489, 4490
    - yields, 1160
  - growing—*see also below*, varieties—in—
    - France, 3446
    - Holland, 1151
    - Italy, 1236c
    - Switzerland, 1150
  - growth, 2,4-D affects, 1480
  - leaf composition, 39, 1208, 2408
  - mutations, 1165, 2236
- Peach (*continued*)—
  - nutrition—*see also above*, composition—
    - boron, 253
    - foliar, 3502
    - magnesium, 2408
    - manganese, 2400
    - manuring, 143, 152, 3508, 3511, 4480
    - nitrogen, 1206, 2274, 3502
    - potassium, 150
    - a review, 4453
    - salt injury and tolerance, 153, 2412
  - pests—
    - aphid, green—*see Myzus persicae*
    - *Cryptophasa unipunctata*, 327
    - fruit flies (*Ceratitis capitata*, etc.), 323, 385, 1386, 2499, 2500, 3642
    - leafhopper (*Colladonus* spp.), 3689r
    - oriental fruit moth (*Cydia* (=*Grapholitha*=*Laspeyresia*) *molesta*), 331, 332, 1396, 3634, 3650
    - plum curculio (*Conotrachelus nenuphar*), 1396, 3634
    - scale—
      - white (*Diaspis pentagona*), 1435o
      - Forbes (*Aspidiotus forbesi*), 344, 3683
      - olive (*Parlatoria oleae*), 4261
      - San José (*Quadraspidiotus perniciosus*), 3683
    - tree borer (*Sanninoidea exitiosa*), 1395, 3648
    - tree borer, lesser (*Synanthedon pictipes*), 3648
    - twig borer (*Anarsia lineatella*), 4261
    - in the U.S.A., 2546h, 3633
  - planting on old peach soils, 152, 2461, 4489
  - pollination, 64, 129, 132
  - processing, drying, 3535
  - processing, juice technology, 3539k
  - propagation—
    - by cuttings, 3463
    - by grafting, 110
    - by marcotting, 1174
  - pruning, 170, 4482
  - root systems, 2262
  - rootstocks—
    - in Australia, 3469
    - in New Zealand, 1182
    - *Prunus besseyi*, 127
  - seed embryo culture, 3461
  - seed germination, 1168
  - soil—
    - management—*see also above*, nutrition—
      - cover crops and grass, 1206, 2280, 3511
      - methods compared, 159
      - mulching, 3416, 3511
    - moisture studies, 154
    - sickness, 258
    - water-logging, 1323
  - spray programmes, 1299, 1435p, 2546b
  - spray residues, 3683, 3684
  - storage, 3531, 3615, 3673
  - varieties—*see also above*, growing—in—
    - Algeria, 201p
    - Canada, 97

Peach—varieties in (*continued*)—
    Italy, 100, 201a, 2200, 3284
    Portugal, 99
    South Africa, 2216
    the U.S.A., 1159, 1160, 3539w
Pear—
  anatomy, graft union, 2252, 3468
  antibiotics affect, 357
  as apple rootstock, 1155
  blossom thinning, 173
  breeding, 93, 94, 201s, 1153, 4484
  climate—
    drought resistance, 2251
    hail damage, 2427
    spring frost injury, 1313, 2420
    spring frost protection, 1313
    winter injury, 3579
  composition, fruit, 1211, 1214, 1236i, 2305, 2322i, 2405, 3521, 3536
  composition, leaf, 147, 1208, 3778
  diseases—
    bacterial, fire-blight (*Erwinia amylovora*), 372 l, 2442, 2443, 2445, 3689p
    cause uncertain, leaf reddening, 3579
    fungus—
      *Alternaria kikuchiana*, 1346
      fleck (*Fabraea maculata*), 3611
      phytophthora rot (*P. cactorum*), 1345
      scab (*Venturia pirina*), 201s, 286, 287, 290, 291, 1435h, 2449, 2454, 2545e, 3671, 3674
    non-parasitic—*see also above*, climate, *and below*, nutrition—blossom blast, 2403
    virus, bark necrosis, 1303
    virus, stony pit, 2405
  fruit—*see also below*, packing *and* storage—
    abnormal, 259, 1435a
    browning, enzymic, 1216
    composition—*see above*, composition
    drop, spraying or dusting to retard, 1199
    maturity tests, 3539h, 3539q
    quality, factors affecting, 1176
    respiration, 188, 3518
    ripening, growth substances hasten, 186-188, 1200, 2293
    ripening, juice content affected by, 190
    thinning, 174, 2291
  fumigation, tree, 2501
  grading—*see below under* packing
  growing—*see also below*, varieties—
    in Australia, 3539e
    in Belgium, 3539g
    in France, 3446, 3447
    history, 2210
    in Italy, 201f
  growth, 2,4-D affects, 1480
  leaf composition, 147, 1208, 3778
  mutations, 1154
  nutrition—*see also above*, composition—
    boron, 2272, 2403, 2405, 3502, 4490
    copper, 254, 2400
    foliar, 2272, 2403, 3502
    leaf analysis a guide to, 3778
    magnesium, 1303
Pear—nutrition (*continued*)—
    manuring, 2110, 2119g, 3506
    mineral deficiencies, 1208
    nitrogen, urea sprays, 3502
    potassium, 1303
    a review, 4453
    zinc, 2400
  packing and grading, 201q, 2314, 2322j, 3532
  pests—
    aphids, 3689e
    blossom weevil (*Anthonomus cinctus*), 318
    *Cetonia aurata*, 2545q
    codling moth (*Cydia* (=*Carpocapsa*=*Laspeyresia*) *pomonella*), 1391, 1393
    control, general, 1300
    leaf-curling midge (*Dasyneura pyri*), 2491, 2501
    leaf miner (*Lithocolletis crataegella*), 372g, 1389
    mites, leaf blister or bud (*Phytoptus* (*Eriophyes*) *piri*), 1373
    sawfly (*Hoplocampa brevis*), 338, 2514
    scale (*Quadraspidiotus schneideri*), 2495
    slugworm (*Caliroa* spp.), 340, 2545w
    sucker or psylla (*Psylla pyricola*=*P. pyri*), 4465
  physiology, 2251
  pollination, 129, 132
  processing—
    canning, 3539h
    drying, 3535
    juice extraction, 190
  products and by-products, 1236i, 2322i
  propagation—*see also below*, rootstocks—
    by budding, 3468
    by cuttings, 1236n
    by grafting, 110, 2252
  pruning—
    Bouché-Thomas method, 2083
    as cordons or hedges, 3473
    Renaud method, 2298
  rootstocks—*see also above*, propagation—
    *Amelanchier* spp., 124, 1176
    in Australia, 3469
    fruit quality affected by, 1176
    for hedges, 3473
    nursery behaviour, 2110
    quince, 123, 3471, 3579
    -scion relationships, 123, 2251
    seedling, raising of, 1171, 1179
    *Sorbus* spp., 1176
  seed storage, 2322p
  soil—
    management—*see also above*, nutrition—cover crops and grass, 147
    management, mulching, 1202, 2110, 3416
    water-logging, 1323
  spray programmes, 1299, 3690d
  stem builders and intermediates, 1179, 1183
  storage—
    in Canada, 1222
    cold, 1223
    extractable juice content affected by, 190
    gas, 1224, 2319, 3522, 3539j

Pear—storage (*continued*)—
    moss, 2322f
    in plastic film, 1227
    rots, 195
    varietal behaviour, 3539q
  training—*see above*, pruning
  variety(ies)—
    in Argentina, 2234
    Bartlett, 1224, 4482
    Beurré Clairgeau, 1236k
    in Canada, 97, 1048
    cooking, 4472
    for hedges, 3473
    in Italy, 2220
    in North Africa, 201p
    origin, 2322d
    perry, 3536, 3539d
    in Sweden, 3471
    in Switzerland, 201q
    in the U.S.A., 1159, 3458
  windbreaks for, 2110
Peat—
  manurial value of, 2646
  pots or soil blocks, 75, 3460
  soil pathogens in relation to, 3786
  waste, for glasshouse heating, 3767
Pecan—
  climate, winter injury, 2387
  composition, leaf, 1291
  diseases, 307, 1056, 2481, 2532, 3576
  nut storage, 2388
  nutrition—
    magnesium, 256
    manuring, 1291
    minor element, 2386, 2481
    potassium, 2387
  oil, 2904
  pests, 350, 1056, 1371, 3576
  propagation, vegetative, 3572c
  research in the U.S.A., 2101
  root system, 2386
  varieties, 242, 1159
Pectic substances of pear, 3521
Pectin from citrus waste, 3076
Pectin from tamarind, 4446x
*Pelargonium limonum*, 836
Pelleting seed—*see* Seed treatment
*Pellicularia filamentosa—see Corticium solani*
*Pellicularia koleroga*, 1992, 4339
*Penicillium*—
  *digitatum*, 801, 832 l, 3054, 4243
  *gladioli*, 3672
  *glaucum*, 3390
  *italicum*, 832 l
  spp. on citrus, 1885, 1886, 3073, 4247
  spp. on tomato, 528
Pennsylvania agric. Exp. Stat., A.R., 3323m
*Pentatrichopus fragaefolii* (=*P. fragariae*), 3600
*Pentodon punctatus*, 2862
*Pentodon* sp. on apple, 321
Peony—
  growing in the U.S.A., 3011o
  history, 4096
  varieties, 3011m
*Peperomia ornata*, 4155
*Peperomia* spp., diseases, 2944
Pepper—
  black (*Piper*)—
    growing—
      in India, 1702
      in Indo-China, 615h
      a review, 579
      in Sarawak, 1704
      in the U.S.S.R., 1705
    insecticidal action of, 2705
    research in Australia, 2109
    research in Indo-China, 1045, 1703
  red—*see Capsicum*
  sweet—*see Capsicum*
Peppermint—*see under* Mint
*Perileucoptera coffeella*, 1999
*Perilla* spp.—
  eosine affects, 1112
  photoperiodic response, 1093
  vernalization, 2945
Periodicals, agricultural, in Latin America, 3332
Periodicals, new or revived, 1060, 2114-2118, 3318-3322, 4492, 4493
*Peronospora*—
  *destructor*, 2756, 3881-3883, 3885
  *dianthicola*, 635
  *parasitica*, 1536, 2664, 3896
  *sparsa*, 3011a
  *spinaciae*, 2783
  *tabacina*, 573
*Perrisia oleae—see Dasyneura*
Perry pear composition, 1236i
*Persea* species—*see also* Avocado—disease resistance, 4174
*Persectania ewingii*, 2708
Persimmon (*Diospyros kaki* and other *Diospyros* spp.)—
  breeding, 1153
  composition, leaf, 1208
  defoliation, growth substance delays, 1201
  fruit respiration, 3518
  growing in South Africa, 3092
  pests, 1871, 3100n
  propagation, vegetative, 110
  salt tolerance, 2412
  seed sowing method, winter hardiness affected by, 3093
  varieties, 1159
Peru—
  castor bean growing, 1735
  onion growing, 3955j
  plant diseases, 3575
Pest(s)—*see also individual pests and hosts*—
  of botanical collections, 1145n
  in Canada, 1435i
  of chimaeras, 3335
  control—*see also* Insecticides—
    biological, 331, 332, 372n, 382, 752, 987, 992, 994, 1394, 1424, 1876, 1877, 1912d, 1912m, 1975, 1998, 2520, 2545d, 2830, 3141, 3147, 3150, 3237, 3650, 3667, 3689k, 3697, 4262, 4264k, 4264 l, 4264s, 4320, 4435, 4447u, 4461, 4476, 4487

Pest(s)—control (*continued*)—
    ecological, 1511
    by electricity, 1080
    by electromagnetic waves, 2967
    by electronic treatment, 3334
    by gas under pressure, 2967
    in glasshouses, 1061 l
    manuals on, 2082, 3272, 3287
    in stored products, 1080, 1375
    in the tropics, 3293
    on woody ornamentals, 2986
  in France, 1297
  identification of, 1296, 2398
  incidence, estimation of, 4447j
  incidence, forecasting, 249
  resistance and tolerance to, 1298
  of spices, 2869
  in the U.S.A., 1376
  of vegetables, 1647z
  in the Wallis Islands and Futuna, 1016 l
Petroselenic acid in seed oil, 1734
*Petunia*—
  parthenocarpy, 1762
  × tobacco hybrid, 2867a
  varieties, 2946, 4079
  X-ray responses, 2947
*Phaedon cochleariae*, 3901
*Phaseolus—see also* Bean (*Phaseolus*)—*aureus*, 3444i
*Phaseolus lathyroides*, 1015
*Pheidole punctulata*, 1996, 1997, 3147
Phenology—*see* Climate
*Phialodiscus discoideus*, 4327
*Philaenus leucophthalmus*, 2498
Philippines—
  cauliflower growing, 431
  coffee growing, 4323
  food plants, composition, 3781
  sugar cane varieties, 1017b, 2043, 3205, 4371
*Philodendron cordatum*, 4465
*Philophylla heraclei*, 1647v
*Phlegetonia delatrix*, 3140
*Phloeotribus scarabeoides*, 3090
Phlox flowering, growth substance enhances, 3922
Phlox pests, nematode, 649
*Phoenix roebeleni*, 1795
*Phoma*—
  *betae*, 1603
  *chrysanthemicola*, 735v
  *destructiva*, 3933
  *rustrupii*, 3891
  sp. on apple, 373a
  *taraxaci*, 3281
*Phomopsis*—
  *californica*, 789
  *cinerescens*, 89
  *citri—see Diaporthe citri*
  *dauci*, 2768
  *oncostoma*, 4162z
*Phoradendron flavescens—see* Mistletoe
*Phormium tenax*—
  diseases, cause uncertain, 1723, 4035, 4036
  pests, 4034
*Phormium tenax* (*continued*)—
  research in New Zealand, 1038
*Phorodon humuli*, 4045
Phosphatase—*see under* Enzymes
Phosphorus—*see also individual crops under* nutrition—
  absorption by roots, 2178, 2812, 2813, 3386, 3879, 3911, 3926
  content of plants, soil temperature affects, 467
  determination, 2143, 2208n
  fertilizers, 2185
  foliar application, 3412
  nutrition of—
    citrus, 772, 773, 4195
    ornamentals, 2185
    sugar cane, 2051
    vegetables, 2185
  radioactive, 1573, 2176-2178, 2181, 2523, 2812, 2939, 3412, 3879, 3959, 4446i
  recretion by leaves, 2181
  translocation in plants, 21, 3879
Photographs, leaf, as a basis for leaf area estimation, 3350
Photometer, flame, 2135, 2143, 3444h
Photoperiodic responses—*see also* Photoperiodism—of—
  azalea, 728
  beetroot, 3886
  begonia, 657
  *Bryophyllum*, 4128
  campanula, 2933
  chrysanthemum, 639, 640, 641, 644, 2931, 2938, 4088, 4089
  citrus, 780
  cucumber, 3955q
  gladiolus, 664, 2961
  *Hibiscus*, 4027
  *Kalanchoë*, 79f, 691, 692, 735e, 1145c, 2208q, 3443j
  kok-saghyz, 2903
  onion, 475
  pea, 3910
  *Perilla*, 1093
  poinsettia, 3006, 3007
  shasta daisy, 2931
  spinach, 2781
  strawberry, 214, 1057
  sugar cane, 981, 2078i, 4390, 4391
  tomato, 497, 3910
  *Xanthium*, 2160
Photoperiodism—*see also* Photoperiodic—
  biochemistry of, 2160
  and $CO_2$ metabolism, 3443j
  growth substance relationships, 2150, 2156, 3382
  light and darkness periods in, 2156
  reviews, 79m, 1145w, 4163d
  and thermoperiodism, 1092
Photosynthesis, 779, 1098, 1279, 1281, 2154, 2161, 2208 l, 2251, 3047, 3360, 3361, 3443c, 3443u, 3976
Phototropic response in *Coleus*, 2157
*Phyllanthus acidus*, 3270o

*Phyllanthus emblica*, 3266, 3270o
*Phyllocoptes fockeui*, 1373, 2491
*Phyllocoptes quadripes*, 4485
*Phyllocoptruta oleivora*, 3060, 4264q
*Phyllophaga* spp. on sugar cane, 4411, 4447z
*Phyllosticta*—
  *dahliaecola*, 662
  sp. on okra, 1592
  *sycophila*, 89
Phyllotaxis, 1742r
*Phylloxera*—*see* Vine pests
*Physalis*—
  *floridana*, 3950
  *peruviana*, 2325, 2326, 3542
  *pruinosa*, 2326
*Physalospora obtusa*, 280
*Physalospora tucumanensis*, 4404, 4405, 4421
Physiology, a book on plant, 3273
*Physocarpus opulifolius*, 4141
*Phytelephas macrocarpa*, 1742a
Phytofluene in plants, 1089
*Phytomyza atricornis*, 735p
*Phytomyza ilicis*, 4143
Phytoncides from onion, 542h
*Phytophthora*—
  *cactorum*, 246, 284, 301, 1343-1345, 1354, 3606
  *capsici*, 453
  *cinnamomi*, 750, 751, 832x, 832y, 1365, 2995, 4092, 4150, 4174
  *cryptogea*, 2951
  *faberi*, 3135
  *fragariae*, 208, 1246, 1295e, 1353, 2469
  *infestans*, 249, 543n, 1623, 2822, 3674, 3932, 3933, 3938
  *lateralis*, 4150
  *megasperma*, 3616
  *palmivora*, 1957-1961, 3131, 3136, 3137, 3148, 4269, 4305, 4361, 4490
  *parasitica*, 574, 1367, 3072, 3989, 3990
  *phaseoli*, 3870
  spp. on—
    apple, 3581
    loganberry, 1352
    *Peperomia*, 2944
    tobacco, 2859
*Phytoptus gracilis*, 2491
*Phytoptus piri*, 1373
Phytotoxicity—*see* Herbicides *and* Spray injury
*Picea pungens* propagation, 1812
*Picea* spp., ornamental, in Argentina, 1813b
*Pieris*—
  *rapae*, 382, 3697, 4483
  spp. (butterfly), biological control, 3667
  spp. (*Ericaceae*), pests of, 4143
Pigments—
  anthocyanin—
    identification, 15
    in plants, 3011w, 4072
    synthesis and respiration related, 2168
  anthoxanthin, in yellow flowers, 4162x
  cacao bean, 1966, 3123
  carotenoid—
    in capsicum, 539
Pigments—carotenoid (*continued*)—
    in citrus fruits, 783, 1846, 4264g
    in violet, 3397
  flavonoid, in antirrhinum, 2950
  flavonoid, in dahlia, 661
  in fruit trees, 3515
  hematin, 3443 l
  in hevea latex, 2079e
  moreollin, 1742 l
  pelargonidin, 1648g
  photosynthetic function of, 3443c
  plant sources of, 2868
  in *Rhamnus alaternus*, 1742c
  synthesis, light affects, 3915
  in tomato fruits, 2106, 3915
  xanthophylls, 2139
Pimento (*Pimenta racemosa*), 1742n
Pimiento—*see Capsicum*
Pineapple—
  composition, fruit, 946, 2014, 4356
  diseases, non-parasitic, fruit breakdown, 946, 2015, 2017
  diseases, non-parasitic, yellow disease, 2016
  fruit—
    fumigation, 844
    maturity tests, 2014
    respiration, 3518
  growing—*see also below*, research—in—
    Australia, 942
    British Guiana, 4268
    British Honduras 4464
    French West Africa 941
    South Africa 2211, 4355
  harvesting, 3184
  nutrition, 594, 944, 1917
  packing, 3184
  pests—
    *Lybindus dichrous*, 2020
    mealybug (*Pseudococcus brevipes*), 2018, 2019
    mite, red spider (*Dolichotetranychus* (*Stigmaeus*) *floridanus*), 2018
    nematode, 3185
    scale (*Diaspis bromeliae*), 2018
  processing, drying, 4446m
  propagation, 943, 2013
  research in—
    Australia, 2109
    Costa Rica, 2012
    India, 4477
    Jamaica, 836
    Malaya, 1915
  rhizosphere microflora, 945
  soil management, conservation, 3183
  soil management, weed control, 2558, 3706, 3750
  storage, 2017, 3586
  varieties, 2013, 3102, 3316
*Pinus* spp., ornamental, in Argentina, 1813b
*Pinus* spp., seed germination, 4141
Piperaceae of Trinidad and Tobago, 4068z
*Piptadenia glandulifera*, 4065
*Piptadenia peregrina*, 2877
*Piscidia erythrina*, 589

- Pistachio (*Pistacia* spp.)—
  - diseases, 1367
  - growing in Syria, 1292
  - pests, 243
  - propagation, vegetative, 4487
- *Pistacia* spp., distribution and taxonomy, 2389
- *Pistacia* spp., nematode resistance, 243
- *Pithecolobium cauliflorum*, 4006
- *Planococcus citri*, 1681
- *Planococcus kenyae*, 916, 1996, 1997, 3303
- Plant—
  - breeding—*see* Breeding *and under separate plants*
  - distribution, analysis of, 2133
  - growth and development, physiological aspects, a review, 3539s
  - Pathology Service, Wageningen, Year book, 2119k
  - protection—
    - a bibliography, 2081
    - methods, a review, 1435r
    - Organ., European, Rep., 4494d
    - by quarantine, 3270e, 3573, 4447f
  - registration, 2128
  - specimens, preservation, 3359
  - surface/fresh weight ratio, transpiration related to, 3373
- Plantation crops in Indonesia, 1076
- Planting—
  - contour—*see also* Soil conservation—229, 3539o, 3572k
  - crops in groups on the square, 3770, 3970
  - fruit trees, explosives for, 2095
  - on land previously occupied by same crop—*see* Replanting
  - machines, 735w, 3435, 3437
  - trees, 3435
- *Plasmodiophora brassicae*, 1541, 2838c, 3897, 3955i
- *Plasmopara viticola—see* Vine diseases, fungus
- Plastic(s)—
  - copra utilization for, 3270q
  - covers for—
    - banana bunches, 1930
    - fumigating plants or soil, 1372, 1398, 1444, 1517
    - plants, 1797
  - films for—
    - packaging fruits and vegetables, 487, 1227, 1232, 3661
    - packaging plant material, 2204
    - plant propagation, 201n, 704, 732, 1174, 1794, 1798, 2204, 2206, 2925, 3004
    - storing—
      - bulbs, 679
      - cuttings, 628
      - fruit, 3530
    - wrapping fruit, 1819
  - as glass substitutes, 1495
  - materials, horticultural uses, 2205
- *Platyptilia carduidactyla*, 3790
- Pleiocotyly in tomato, 1621
- *Pleospora herbarum*, 3905
- Plum (including prune and gage)—*see also* Damson—
  - anatomy, fruit, 1236q
  - anatomy, wood, 1177
  - ×apricot hybrids, 2237
  - blossom thinning, 173
  - blossoming, growth substances delay, 1198
  - breeding, 2237
  - cherry (*Prunus cerasifera*), 2322m, 2322p, 2416
  - climate—
    - drought injury, 266
    - hail damage, 2427
    - insolation injury, 2417
    - spring frost injury, 2416
    - winter chilling requirements, 2216
    - winter injury and hardiness, 1188, 3481
  - composition—
    - fruit, 201w, 1211, 2303, 2305, 3537
    - leaf, 1325, 3778
    - plant, 1177
  - diseases—
    - bacterial canker (*Pseudomonas mors-prunorum*) 111, 3602
    - bacterial spot (*Bacterium* (*Xanthomonas*) *pruni*), 2442
    - fungus—
      - brown rot (*Sclerotinia* (*Monilia*) spp.), 1347, 1417
      - *Cylindrosporium padi*, 1348
      - phytophthora rot (*Phytophthora cactorum*), 1345
      - *Rhodoseptoria ussuriensis*, 2237
      - rust (*Tranzschelia pruni-spinosae*), 299, 2467
    - virus—
      - banded chlorosis, 2431
      - bark split, 1303
      - phony, 1331
      - ring pox and/or spot, 3592
      - in Yugoslavia, 2546 l
  - foliation, delayed, 2216
  - fruit—*see also below*, storage—
    - anatomy, 1236q
    - malformation, 259
    - maturation, growth substances affect, 184
    - maturity for canning, 3538
  - growing—*see also below*, varieties—
    - in France, 3446
    - under glass, 64
    - in Italy, 1166
  - growth, height, winter hardiness affected by, 1188
  - nutrition—
    - boron, 253
    - iron, 1302
    - leaf analysis a guide to, 3778
    - magnesium, 1303
    - a review, 4453
    - salt injury and tolerance, 153, 2412
    - zinc, 1303
  - pests—
    - *Caliroa limacina*, 340
    - *Cerambyx dux*, 3640

- Plum (including prune and gage)—pests (*continued*)—
  - *Colaspis quattuordecimcostata*, 3639
  - *Cryptophasa unipunctata*, 327
  - curculio (*Conotrachelus nenuphar*), 372y
  - fruit flies (*Ceratitis capitata*), 323
  - mites (*Phyllocoptes* and *Phytoptus* (*Eriophyes*) spp.), 1373, 2491, 3690g
  - sawflies (*Hoplocampa* spp.), 338, 2513, 3677
  - scales (*Aspidiotus forbesi*), 344
  - physiology, respiration, 3362
  - pollination, 129, 131, 1195, 3490
  - processing—
    - canning, 3538
    - drying, 3535
    - juice, 3537, 3539k
  - propagation by—
    - budding, 111
    - cuttings, 3463
    - frameworking, 1177
    - grafting, 110, 112
  - rootstocks—
    - in Australia, 3469
    - myrobalan, 126
    - nursery behaviour, 2110
    - *Prunus*—
      - *besseyi*, 127
      - *pumila*, 112
      - *ussuriensis*, 3481
  - seed, poisonous properties, 3516
  - seed, stratification, 108
  - storage, 2319
  - tetraploid, 2322m
  - varieties—*see also above*, growing—
    - in Belgium, 3457
    - in Canada, 97, 1048
    - in Great Britain, 95
    - identification, 101
    - in Italy, 2220
    - in North Africa, 201p
    - for processing, 218
- *Plusia chalcitis*, 3933
- *Plutella maculipennis*, 382, 440, 2655, 3697
- *Poa pratensis*, 1780
- *Podischnus agenor*, 4418
- *Podosphaera leucotricha*—*see* Apple diseases
- *Podosphaera oxyacanthae*, 296
- Poinsettia—
  - diseases, 3008, 4156
  - flower retention, growth substances affect, 4490
  - flowering, methods of delaying, 3007
  - nutrition, 722
  - photoperiodic response, 3006, 3007
  - tetraploid, 4490
- Poison ivy (*Rhus radicans*), 3727
- Poisoning trees—*see* Herbicides
- Poland, mushroom growing, 3955h
- Polarity in vine, 2361, 2395u
- Pollen—
  - composition, 3572o
  - germination—
    - bean, 2686
- Pollen—germination (*continued*)—
    - cacao, 870, 3129, 3130
    - media for, 3338
    - *Prunus* spp., 2256
    - sprays affect, 2256, 3129, 3130
    - vine, 2395c
  - grains of *Saccharum* spp., 2078n
  - growth substance treatment, 3922
  - mixed, use of, 24, 1192, 1193, 1195, 1238, 1843
  - source, effects of, 1193, 1195
  - sterility in onion, 2752
  - storage, 2208o, 2256, 3338
  - viability, tetrazolium test for, 132
  - X-ray treatment of, 3451
- Pollination—
  - almond, 128, 2385, 3570
  - *Annona* spp., 4440
  - apple—*see* Apple
  - apricot, 129
  - avocado, 4171
  - by bees—*see* Bee
  - black currant, 1238
  - brussels sprouts, 543j
  - cacao—*see* Cacao
  - *Capsicum* spp., 3951
  - cement dust affects, 819
  - cherry—*see* Cherry
  - citrus, 1843, 3100u
  - *Corylus* spp., 128, 1288, 1289
  - cucumber, 448, 3432
  - fig, 128, 3494
  - fruit tree, 1192, 3539n
  - glasshouse crops, 3432, 3491
  - gooseberry, 1238
  - incompatibility, X-rays overcome, 3451
  - jackfruit, 4444
  - kale and kohlrabi, 543j
  - litchi, 4252
  - loquat, 4264y
  - manila hemp, 4031
  - melon, 443, 3956a
  - oil palm, 936
  - okra, 2746
  - olive—*see* Olive
  - pea, 2684, 3843
  - peach, 129, 132
  - pear, 128, 132
  - pecan, 128
  - petunia, 1762
  - plum, 128, 131, 1195, 3590
  - *Primula* spp., 735f
  - pumpkin, 2916
  - *Saintpaulia* spp., 1763
  - seed germination affected by, 1194
  - *Strophanthus* spp., 4013
  - sugar cane, 2078i, 4393, 4446o
  - tobacco, 577g, 1670
  - tomato, 496, 1057
  - vine, 132, 1274, 3559
  - walnut, 128, 2392-2394
- *Pollinia pollini*, 4264b
- *Polyalthia canangioides*, 723
- *Polychrosis botrana*, 333

*Polychrosis* sp. on vine, 2478
Polyembryony in citrus, 1912c, 3022
Polyembryony in coconut, 891
Polyethylene—*see under* Plastics
*Polygonum coccineum*, 3709
*Polygonum* spp., control, 341
Polyphenols, disease resistance associated with, 2826
Polyploidy, colchicine induces—*see* Colchicine
Polyploidy in plant breeding, 2229, 3357, 3011k, 4163k
Polythene—*see under* Plastics
Pome fruit diseases in Uruguay, 2545v
Pomegranate, 2322a, 2412, 2545x
Pomological Congress of France, 3539f
*Poncirus trifoliata—see under* Citrus
*Popillia japonica*, 1056
Poppy, oil-seed, breeding and selection. 4068m
Poppy, opium, growing in Argentina, 590, 1714
Portugal—
  carob growing, 4179
  lily growing, 4112
  peach varieties, 99
Pot(s)—
  algal growth controlled on, 624, 4162r
  for house plants, 623
  paraffin wax, 1307
  peat, 75, 1498
  plants, root injury to, 3431
  plants, soil for, 620, 4163f
  plastic, 503
  soil or peat blocks, 1139, 1140, 1141, 2208w, 3460
  various types, 1058
  washing machine, 1142
*Potamogeton* spp., control, 2572
Potash Institute, International, 4
Potassium—
  absorption by cells, 3370
  carbohydrate metabolism affected by, 3444g
  deficiency in fruit crops, 4453
  determination, 2143
  nutrition of crops—*see individual crops under* nutrition
  radioactive, 2176
  source, sugar cane by-products, 4447d
*Potentilla* spp., seed identification, 384
*Pratylenchus*—
  *coffeae*, 1368, 3445
  *pratensis*, 1759
  spp. on—
    narcissus, 683
    strawberry, 1369
    sugar cane, 995
Preservation of plant specimens, 3359
Pricking out, conveyor belt for, 1499
Prickly pear—*see Opuntia megacantha*
Primula—
  *malacoides*, 4163m
  pests, 1381
  pollination, 735f
  polyploid, 3011k
  seed germination, 2162
  seed storage, 650
Prince George Domin. exp. Stat., B.C., Progr. Rep., 1048
Privet (*Ligustrum vulgare*)—*see also Ligustrum*—growth control, 2985
Proceedings—
  bot. Congr., Stockholm, 7th int., 3282
  nat. Shade Tree Conf., combined, 4494g
  United Planters, Ass., sci. Dep. (sci. Sect.), annu. Conf., 4494 l
*Proceras sacchariphagus*, 3237
*Prociphilus betae*, 2773
*Prodenia ornithogalli*, 2655 —
Production—*see under* Trade
*Prolasioptera berlesiana*, 1905
Propagation—*see also particular methods*—
  of fruit plants, 2239
  house, design of, 3428
  humidification systems for—*see also* Cuttings, mist spray—79x
  methods at the Arnold Arboretum, 4162o
  vegetative, of ornamental plants, 2170
*Prosopis juliflora*, 2580, 3730
Protein—
  content of apical shoots, 2142
  of green leaves, 1145e
  metabolism in plants, 3392
*Protoparce sexta*, 1686, 3993
Protoplasm, plant, properties of, 3444k
Prune—*see under* Plum
Pruning—*see also individual plants*—
  conifers, 3011 l
  fruit trees, 1027, 2298, 2299
  Lepage method of, 167
  a manual on, 1027
  mechanized, 3031
  Oeschberg method of, 168
  rejuvenation, 3032
  woody ornamentals, 1027, 1793
  wounds, treatment of, 4340, 4490
Prunings, disposal of, 172, 1283
*Prunus*—
  *avium*, 201j
  *besseyi*, 127
  *cerasifera*, 2322m, 3463, 4077
  *dasycarpa*, 102, 2322k
  *laurocerasus*, 3009
  *mahaleb*, 1172, 3463
  *myrobalana*, 125
  *pumila*, 112
  *serotina*, 3010
  spp.—
    as apricot rootstocks, 3482, 3483
    ornamental, rootstocks for, 724
    pollen germination, 2256
    propagation by cuttings, 1172, 1796, 3463
    propagation by marcotting, 1794
  *tomentosa*, 2237
  *ussuriensis*, 2237, 3481
  *virginiana*, 3599
*Psalidium maxillosum*, 317
*Psalliota* spp.—*see* Mushroom
*Pseudococcus*—
  *brevipes*, 2018, 2019
  *citri*, 323, 874, 1877, 3303, 4239

*Pseudococcus* (*continued*)—
  *gahani*, 1877
  *maritimus*, 1877
  *njalensis*, 3132
*Pseudomonas*—
  *angulata*, 1678
  *caryophylli*, 1813h
  *lachrymans*, 2443
  *maculicola*, 1540
  *medicaginis*, 3783
  *medicaginis* f. *phaseolicola*—*see below*, *phaseolicola*
  *mors-prunorum*, 3602
  *phaseolicola*, 470, 2696, 2697, 3857, 3867, 4490
  *prunicola*, 3602
  *punctulans*, 2815
  *solanacearum*, 1512, 2815
  sp. on blueberry, 1334
  *syringae*, 298, 2447, 3602, 3664, 3665, 3783
  *tabaci*, 1678
  *tumefaciens*—*see* Crown gall
*Pseudoperonospora humuli*, 608, 3674, 4041
*Psidium guajava*—*see* Guava
*Psila rosae*, 1544, 1548, 3894, 3895
*Psylla buxi*, 4145
*Psylla pyricola* (=*P. pyri*), 4465
*Pterandrus rosae*, 1384
*Pteridium aquilinum*—*see* Bracken
*Pteronidea* (*Pteronus*) *ribesii*, 2545j
*Pteropus edwardsii*, 4447c
*Puccinia*—
  *antirrhini*, 2951, 4097
  *asparagi*, 429, 3796, 3797
  *carthami*, 2922j
  *menthae*, 1719
  *pruni-spinosae*, 296
Puerto Rico, sugar cane growing, 4364, 4447m
Puerto Rico, sugar cane research, 3206
Pumpkin—*see also* Squash *and* Cucurbits—
  composition, fruit, 1632
  diseases, 453
  growing in South Africa, 542n
  parthenocarpy and pollination, 2916
Purdue Univ. agric. Exp. Stat., A.R., 4485
*Pyracantha* spp., diseases, 725
Pyramidon, permeability of plant cells affected by, 2148
Pyrethrum—
  anatomy, 2899
  diseases, 2900, 4051
  growing in the Belgian Congo, 615m
  growing in India, 4049
  nutrition, 594, 1917
  pyrethrins determination, 2922c, 2922h, 2922k, 4068g
  research in the Belgian Congo, 834
  research in Kenya, 3303
  soil management, mulching, 1917
  varieties, 4050
*Pyrilla* spp. on sugar cane, 2059, 3676, 4419
*Pyroderces rileyi*, 799
*Pythium*—*see also* Damping off—
  *aphanidermatum*, 1558, 3956b
*Pythium* (*continued*)—
  *arrhenomanes*, 3236, 4406
  *debaryanum*, 1760
  spp. on—
    beetroot, 1603
    geranium, 3672
    loganberry, 1352
    *Peperomia*, 2944
    poinsettia, 3008
    pyrethrum, 4051
  *ultimum*, 1697o, 3057

*Quadraspidiotus*—
  *perniciosus*—*see* San José scale
  *piri*, 348
  *schneideri*, 348, 2495
Quarantine, plant, 1296, 2079j, 2398, 3573, 4447f
Queensland—*see also under* Australia—
  Bureau Sugar Exp. Stats, A.R., 2037
  Dep. Agric. Stock, A.R., 2109
  horticultural research, 837
  nut—*see* Macadamia
Quercetin and isoquercitrin in fruits, 201w, 3572s
Quince (*Cydonia* spp.)—
  pests, 340, 3689e
  as a rootstock for pear—*see* Pear rootstocks
  soil sickness, 258
Quinic acid in fruits, 1215

Rabbit—*see under* Rodent
Radiation, atomic, injury to plants, 2994
Radiation from higher plants, 24
Radioactive—
  carbon monoxide, 3362
  materials, a catalogue of, 3443a
  nutrients—*see also particular elements*—14, 372y, 771, 1095, 1096, 1118, 1145d, 1145v, 2146, 2147, 2154, 2176-2178, 2812, 2939, 3214, 3398, 3399, 3407, 3452, 3729, 3974, 3976, 4003e, 4446i, 4453
  tobacco mosaic virus, 3987
Radiographs—*see* X-ray
Radish—
  bolting, 2771
  chimaeras, 1097
  diseases, 1608, 3896, 3897
  growth substance response, 2771
  nutrition, 1501, 2175, 3426, 3779
  pests, 1520
  pigments, 1648g
  root flavour, insecticides affect, 425
  seed production, 4472
  spacing, 3955u
  transplanting, black, 2770
  varieties, 2627
*Radopholus similis*, 1865, 3016, 4226
Ragwort control, 3759p
Rain—*see under* Climate
Raisin—*see* Vine fruit, dried

- Ramie (*Boehmeria* spp.)—
  - fibre extraction, 601, 1050, 1725
  - growing in—
    - Angola, 3299
    - British Honduras, 4464
    - Cuba, 4037
    - Indo-China, 1725
    - Indonesia, 1724
  - nutrition, 600
  - spacing, 1725
- *Ramosia tupliformis*, 328
- *Ramularia bellunensis*, 615m, 2900, 3303, 4051
- *Ranunculus* spp. control, 376
- Rapport—*see* Report *or* Annual Report
- *Raphia ruffia*, 4038
- Raspberry—
  - breeding, 1239, 2395n, 3544
  - certification, 3574
  - climate, frost damage and resistance, 3545, 3546
  - composition, fruit, 1211
  - diseases, virus, 247, 275, 2433-2435, 2545n, 3690f, 3690l
  - flowering, growth substances affect, 3546
  - fruit anatomy, 2328, 3543
  - fruit flavouring materials, 1242
  - growing—*see also below*, varieties—in Great Britain, 3572i
  - growing in Norway, 2395h
  - growth, gigas forms, 3357
  - harvesting, 3572a
  - nutrition, 3541
  - pests—
    - aphid (*Amphorophora rubitoxica*), 3636
    - cane midge (*Thomasiniana theobaldi*), 372b, 3644
    - leaf and bud mite (*Phytoptus* (*Eriophyes*) *gracilis*), 2491
    - root weevils (*Brachyrhinus* spp.), 1381
    - white grub, 320
  - planting, time of, 2327
  - propagation by root cuttings, 206, 1240
  - research in New Zealand, 1038
  - root regeneration, 206, 1240, 1241
  - soil management, mulching, 196, 207
  - soil management, weed control, 2597, 3708, 3739, 3753
  - spray residues, 371
  - storage of fruit, 217
  - varieties—
    - in Canada, 1048
    - in Germany, 3540
    - in Great Britain, 3544, 3545
    - Miranda, 2327
    - thornless, 205
    - in the U.S.A., 1159, 3458
    - in the U.S.S.R., 1239
- Rat—*see under* Rodent
- *Rauwolfia* spp., medicinal plants, 2878, 4012, 4068t, 4068y
- Red currant—
  - composition, fruit, 2329
  - diseases, 247
  - nutrition, 2119g, 3304
- Red Currant (*continued*)—
  - pests, 247, 328
  - varieties in—
    - Canada, 207, 1048
    - Germany, 3540
    - the U.S.A., 3458
- Red spider—*see under* Mites *and scientific names*
- Reeds for thatching, 602
- Regeneration of cacao trees, 1963
- Regeneration and vegetative propagation, 206, 1240, 1241
- Regina Domin. exp. Substat., Sask., Progr. Rep., 1061m
- Replanting—
  - apples, 1308, 1368, 3582
  - citrus, 768, 795, 1866
  - peaches, 2461, 4489
- Report—*see also* Annual Reports *and* Yearbooks—
  - Agassiz Domin. exp. Farm, B.C., 3295
  - agric. Education in the U.K., 2208x
  - Beaverlodge Domin. exp. Stat., Alberta, 3297
  - biennial, Uganda Dep. Agric., Rec. Invest., 4494k
  - biennial, Vineland hort. Exp. Stat., Ont., 4484
  - Brandon Domin. exp. Farm, Man., 4463
  - Bundesanst. Qualitätsforsch. pflanzl. Erzeugn., Geisenheim/Rheingau, 3298
  - Cacao Res., Imp. Coll. trop. Agric., 1024, 1939
  - Cocoa Conference, 1932
  - Commodity, F.A.O., 2100
  - Cunene Exp. Stat., Angola, 3299
  - Delhi Domin. exp. Stat., Ont., 3958
  - European Plant Prot. Organ., 4494d
  - Fort William Distr. Exp. Substat., Ont., 2102
  - Illinois agric. Exp. Stat., 2106
  - int. hort. Congr., 1061n
  - Kapuskasing Domin. exp. Stat., Ont., 1042
  - Kentville Domin. exp. Stat., N.S., 1043
  - Lacombe Domin. exp. Stat., Alberta, 4474
  - Lethbridge exp. Stat., Alberta, 4475
  - Madras Dir. Inf. Public. agric. Res., 4476
  - McDonald's Corner Domin. hort. Substat., N.B., 3306
  - New Zealand comm. Gdnrs' Ltd, annu. Mtg, 2119c
  - Palermo Inst. Vine and Wine, 3556
  - Prince George Domin. exp. Stat., B.C., 1048
  - Regina Domin. exp. Substat., Sask., 1061m
  - Saanichton Domin. exp. Stat., B.C., 4491
  - Society chem. Ind., London, 1052
  - Sugar Technol. Cuba, annu. Conf., 3197
  - Waite agric. Res. Inst., South Australia, 2119l
- Respiration—*see also individual crops under* physiology *and* storage—
  - fruit, 533, 832o, 3071, 3115, 3368, 3515, 3518
  - inhibitors of, 3443q

Respiration (*continued*)—
  plant, 779, 1098, 1101, 1145k, 1576, 1710, 2167, 2168, 3362, 3443 l, 3443r, 3806, 4379
Réunion—
  essential oil production, 4446v
  fruit growing, 1017j
  sugar cane growing, 1016q, 4446v
Reviews, book—
  Allerton, F. W., Tomato growing, 4448
  Ames, O., and Correll, D. S., Orchids of Guatemala, 2080
  Audus, L. J., Plant growth substances, 1018
  Baldassari, T., Frutticoltura pratica, 1019
  Balzak, S. S., Vasyutin, V. F., Feigin, Ya. G., and Harris, C. D., Economic geography of the U.S.S.R., 4449
  Barker, B. T. P., Cider apple production, 4451
  Barnes, A. C., Agriculture of the sugar-cane, 1020
  Barth, T., and Weinhausen, K., Die Kultur der Blumenzwiebeln, 3271
  Belloni, V. G., Repertorio dei fitofarmaci e guida alla lotta antiparassitaria, 2519
  Blunck, H., Handbuch der Pflanzenkrankheiten, Band V, Tierische Schädlinge an Nutzpflanzen, 2. Teil, Lieferung 1: Diptera und Hymenoptera, 2082
  Blunck, H., Handbuch der Pflanzenkrankheiten, Band V, Tierische Schädlinge an Nutzpflanzen, 2. Teil, Lief. 2, Coleoptera, 3272
  Bonner, J., and Galston, A. W., Principles of plant physiology, 3273
  Brooks, R. M., and Hesse, C. O., Western fruit gardening, 4452
  Chatt, E. M., Cocoa, cultivation, processing, analysis, 3274
  Childers, N. F., and 27 others, Mineral nutrition of fruit crops, 4453
  Dawson, R. B., Practical lawn craft, 3277
  Duque, J. G., Solo e água no polígono das sêcas, 3278
  Finney, D. J., Statistical science in agriculture, 1021
  Freeport Sulphur Company (Tuller, W. N.), The sulphur data book, 4455
  Gardner, H. W., and Garner, H. V., The use of lime in British agriculture, 3279
  Gibberd, A. V., and Gibberd, V. L., A gardening notebook for the tropics, 2084
  Groven, I., and Christensen, H., Oversigt over nogle af de for havebruget og gartneriet vigtigste resultater af Statens Forsøg i Plantekultur samt fra gartneri- og havebrugsorganisationernes forsøgsvirksomhed, 3280
  Hellyer, A. G. L., The encyclopaedia of garden work and terms, 4456
  Hellyer, A. G. L., The encyclopaedia of plant portraits, 1022

Reviews, book (*continued*)—
  von Hofsten, C. G., Studier över släktet *Taraxacum* Wigg med särskild hänsyn till gruppen vulgaria DT i Skandinavien, 3281
  Holttum, R. E., Plant life in Malaya, 2085
  Hyams, E. (Editor), Vineyards in England, 1023
  Istituto di Frutticoltura e di Elettrogenetica, Roma, Nuove uve da tavola italiane, 3283
  Istituto di Frutticoltura e di Elettrogenetica, Roma, Le nuove pesche italiane, 3284
  Jacob, K. C., Madras bananas, a monograph, 1025
  King, N. J., Mungomery, R. W., and Hughes, C. G., Manual of cane growing, 3285
  Kobel, F., Lehrbuch des Obstbaus auf physiologischer Grundlage, 3286
  Köhler, E., and Klinkowski, M., Handbuch der Pflanzenkrankheiten, Band II, Lieferung 1: Die Viruskrankheiten, 2087
  Kreutz, W., Der Windschutz. Windschutzmethodik, Klima und Bodenertrag, 2088
  Kristensen, R., Dyrkning af køkkenurter, 4457
  Krüssmann, G., Die Baumschule, 4458
  Kummer, A. P., Weed seedlings, 2089
  Luckan, J., von Sengbusch, R., and Schuppe, E., Neuzeitlicher Erdbeeranbau, 1243
  Massee, A. M., The pests of fruits and hops, 3287
  Nicolaisen, N., and Nicolaisen-Scupin, L., Lagerungsschäden an Obst, insbesondere bei Kaltlagerung, 1228
  Ordish, G., Wine growing in England, 2090
  Osborn, A., and Bagenal, N. B. (Editors), A practical handbook on the pruning of ornamental and flowering trees and shrubs, rose trees and fruit trees, 1027
  Pearson, C. E., Vegetable growing, 1029
  Plank, R. (Editor), Handbuch der Kältetechnik. IX.Band: Biochemische Grundlagen der Lebensmittelfrischhaltung, 1236m
  Preston, J. F., Developing farm woodlands, 2091
  Proefstation der C.P.V. te Bogor, Handleiding voor de cacaocultuur en cacaobereiding, 1030
  Quenouille, M. H., The design and analysis of experiment, 4460
  Ramsbottom, J., Mushrooms and toadstools: a study of the activities of fungi, 1031
  Rebour, H., Manuel du planteur, 2092
  Rittershausen, P. R. C., Successful orchid culture, 3289
  Saunby, T., Soilless culture, 2093
  Smith, A. M., Manures and fertilizers, 3290
  Steinmetz, E. F., Vocabularium botanicum, 2094

Reviews, book (*continued*)—
  Talbert, T. J., Growing fruit and vegetable crops, 1032
  Tarr, S. A. J., Diseases of fruit and vegetables in the Anglo-Egyptian Sudan, 1033
  Thiele, K. P., and Knauth, A., Die Erdbeere, 1034
  U.S. Department of Agriculture, Testing agricultural and vegetable seeds, 1035
  Verona, O., Malattie nutrizionali delle piante coltivate, 3292
  Wallace, T., and Martin, J. T. (Editors), Insecticides and colonial agricultural development, 3293
  Witte, K., Untersuchungen über den Einfluss erhöhter Luft- und Bodenfeuchte auf den Pflanzenertrag, 3294
  Woolman, J., Chrysanthemums for garden and exhibition, 1036
  Zippelius, H., Die Bodenlockerung im Obst-, Land- und Weinbau durch das Sprengverfahren, 2095
*Rhabdophaga triandraperda*, 4077
*Rhabdoscelus obscurus*, 4420
*Rhagoletis pomonella*, 1388
*Rhagoletis* spp. on cherry—*see* Cherry pests, fruit fly
*Rhamnus alaternus*, 1742c
*Rhamnus cathartica*, 2985
Rhenium, plant response to, 1507
*Rhina barbirostris*, 896
*Rhizobium* spp. for beans, 2687
*Rhizoctonia—see also* Damping off—
  *carotae*, 488
  *crocorum*, 1813m
  *repens*, 4005
  *solani—see Corticium solani*
  spp. on—
    camellia, 1800
    lily, 2965
    poinsettia, 3008
    pyrethrum, 4051
*Rhizoecus coffeae—see Neorhizoecus*
*Rhizoglyphus echinopus*, 4110
*Rhizoglyphus rhizophagus*, 672
*Rhizopus nigricans*, 294, 3615
Rhizosphere microflora, pineapple, 945
Rhodesia—
  Northern, Dep. Agric., A.R., 4494h
  Northern, tobacco growing and research, 1652
  Southern, tobacco growing and research, 552, 2841
*Rhodesian Farmer Year Book*, 4486
Rhododendron—*see also* Azalea—
  diseases, 617, 4159, 4162b
  forcing, 716
  growing in Norway, 735j
  hybridization, natural, 726
  *Jahrbuch, Rhododendron-Gesellschaft*, 4157
  nutrition, 734
  pests, 3011t
Rhododendron (*continued*)—
  propagation—
    by cuttings, 727, 730, 731, 735d, 4157, 4490
    in Germany, 4158
    by tip grafting, 732
  seed germination, 1748
  spp., alpine, in Norway, 735j
  spp., epiphytic, cultivation of, 733
  *Year Book—see also above, Jahrbuch—roy. hort. Soc.*, 726, 727
*Rhodoseptoria ussuriensis*, 2237
*Rhogogaster viridis*, 343
*Rhopalomyzus ascalonicus*, 2761
Rhubarb—
  composition, 3780
  diseases, 1602, 2839c
  forcing, 2105
  varieties, 484
*Rhus radicans*, 3727
*Rhynchophorus ferrugineus*, 898, 1017g, 4318
*Rhynchophorus palmarum*, 896, 3313
*Ribes roezli*, destruction, 1466, 3732
Riboflavin from citrus molasses, 4249
*Ricinus communis—see* Castor bean
Ring culture method for glasshouse crops, 1624, 4448
Ringing—
  citrus, 3050, 4205, 4207-4210
  cucumber, 2675
  fruit trees, 1236h, 3505
  vine, 3567
*Robinia pseud-acacia*, 1810, 1811, 4162z, 4163c
Rodent(s)—
  control, general—*see also* Rodenticides—351, 1404
  *Ctenomys* sp., 1882
  gophers, 354, 1881
  hares, 1405-1407
  mice, 352, 353, 996, 1408, 3663
  rabbits, 1405-1407
  rats, 352, 996, 1408-1410
  repellents, a review, 2546m
  squirrels, 839, 3689j
  *Thryonomus* sp., 933
Rodenticides—
  fumarin, 1409
  phosphides, 351, 372r
  squills, 2901
  toxaphene, 3663
  toxicity to man, 1414
  various, 353, 1408, 1881
  warfarin, 839, 996
Root(s)—
  absorption of nutrients by, 1115, 2178
  adventitious, X-rays induce, 1094
  anatomy of the Compositae, 2179
  anatomy, nematodes affect, 2645
  branching, growth substance induces, 1169
  crops, pests, 1644
  cuttings—*see under* Cuttings
  growth—
    mulching improves, 3775
    quinones in relation to, 2158
    a review on, 3366

Root(s) (*continued*)—
  inducing substances—*see* Growth substances
  injury in pot plants, 3431
  laterals, branching in, 3352
  secretions, 24
  systems of fruit plants and trees, 781, 2262
  tips, growth inhibitors from, 2152
Rootstock(s)—*see also particular plants*—
  fruit tree—
    certification schemes, 3574
    fumigation, 709
    hardy, in Canada, 1180
    identification, methods of, 1825, 1826
    planting, 1178
  scion relationships, 24
*Rosa*—
  *banksiae*, 3617
  *bracteata*, 1467
  *canina*, 2978
  *dilecta*, 2981
  *gallica*, 1787
  *multiflora*, 1032
  *rugosa*, 617
Rose—
  breeding, 694, 3302
  bud union, anatomy, 2979
  climate, frost resistance, 695, 1787
  defoliation, artificial, 2981
  diseases—
    bacterial, 700
    fungus, 701, 1057, 1749, 2982, 3011a, 3617, 4134
    non-parasitic, 2980
    virus, 698, 699
  flowers, cut, packing and storage, 621, 702, 1751, 1790
  flowers, cut, prolonging life of, 3387, 4136
  growing, a book on, 1061a
  growth, growth substances affect, 1788
  hybrids, 4163k
  leaf abscission layer, anatomy, 2981
  nutrition—
    boron, 697
    calcium, 697
    manganese, 2980
    manuring, 696
  oil, 4016-4018
  pest(s)—
    aphids, 1056, 1521
    beetle (*Otiorrhynchus ligustici*), 2983
    red bud borer (*Thomasiniana oculiperda*), 3644
    mites, 701, 1056, 1521
    nematodes, 4135
  polyploid, 4163k
  propagation, vegetative, 1746, 1787, 2927, 2979, 4070, 4132
  pruning, 1027
  research in the U.S.A., 700
  rootstocks, 1786
  seed germination, 2978, 3302
  soil management, mulching, 3416
  soil management, watering of greenhouse, 4133
Rose (*continued*)—
  species—*see also Rosa*—collection at John Innes hort. Instn., 1041
  varieties, 694, 1048, 4079, 4162k
*Rosellinia* sp. on cacao, 3131
Rosewarne exp. Hort. Stat., Station Guide, 1065
Rothamsted exp. Stat., A.R., 4494i
Rubber—
  plants—
    *Asclepias* spp., 2902
    guayule—*see* Guayule
    *Hevea brasiliensis*—*see* Hevea
    kok-saghyz—*see* Kok-saghyz
    *Manihot* spp., 3278
    *Mimusops* spp., 4054
    *Palaquium* spp., 4054
    of the U.S.A., 2868
  trade, 1016y
Rubidium absorption and translocation in plants, 21
*Rubus*—*see also under* Small fruit *and individual berry crops*—
  *glaucus*, 2323
  spp., destruction of—*see* Blackberry
  spp., hybrids, 1041
  stunt—*see* Raspberry diseases, virus
*Rudbeckia* grafted on kok-saghyz, 4057
Rumbeke-Beitem, West Flanders exp. Garden, A.R., 2110
*Rumex hymenosepalus*, 2868
*Rumex* spp. control, 3724
Rushes (*Juncus* spp.) control, 3728
Russia—*see* U.S.S.R.
Rutabaga—*see* Swede
Rutin from *Eucalyptus* spp., 2875

Saanichton Domin. exp. Stat., B.C., Rep., 4491
*Saccharosydne saccharivora*, 4421
*Saccharum*—*see also* Sugar cane—spp., pollen of, 2078n
Safflower (*Carthamus tinctorius*)—
  diseases, rust and root disease (*Puccinia carthami*), 2922j
  growing in Australia, 4063, 4064
  growing in the U.S.A., 4068s
  oil, 2904
  research in the Sudan, 2119j
Saffron—*see Colchicum*
*Sahlbergella singularis*, 879, 1962, 1963
Ste-Clothilde exp. Substat., Quebec, work at, 49
St. John's wort (*Hypericum perforatum*), control, 382, 3697, 3726, 4465
Saintpaulia—
  diseases, 1813q
  growing as a house plant, 735c
  pests, nematode, 651
  pollination, 1763
St. Vincent, coffee samples from, 4447i
*Saissetia oleae*, 797, 1912d
Salinity—*see* Salt *and* Soil salinity
*Salix acutifolia*, 2985
*Salix amygdalina*, 4077
Salsify growing in New Zealand, 406

Salt(s)—*see also* Chloride *and* Sodium—
  absorbing plants, 51
  exchange in plants, 80j
  tolerance and injury of plants, 63, 153, 486, 638, 743, 2412, 2413, 2753, 2953, 3232, 3779, 4177
  uptake by roots, 1115
*Salvia cypria*, 2891
*Salvia splendens*, 652
Sampling techniques—*see* Statistical
San José scale—
  control, 345, 347, 3683
  host plants of, 1435q
  spread, 346
San Remo floric. Exp. Stat., 1745
San Tomé and Principe, cacao growing, 1016w
Sand—
  cherry—*see Prunus pumila*
  culture—*see* Soilless culture
  storm damage to tomato, 2838 l
*Sanninoidea exitiosa*, 1395, 2648
*Sansevieria* spp.—
  diseases, 4131
  as fibre plants, 598
  frost damage, 603
  nutrition, 1726
  weed control, 395, 1726
Santonin from *Artemisia* spp., 584
*Sapindus* spp., saponins from, 4068j
Sapodilla (*Achras sapota*)—
  growing in the U.S.A., 2075
  gum, 1017w
  rootstocks, 4445
Sapogenins, steroidal, 4006
*Saponaria officinalis*, 4008
Saponins, plants containing, 2868, 4068j
Sapote (*Casimiroa edulis*), 3518, 4267
*Saraca indica*, 1813r
Saran tissue, horticultural uses of, 3429
Sarawak Dep. Agric., A.R., 2119i
Sarawak, pepper growing, 1704
Sardinia, horticulture, 1028
*Saxifraga crassifolia*, 2168
Scale insects—*see also* San José *and other individual species under scientific names, and also hosts*—control, 348
*Scaphytopius acutus*, 2432, 3597
*Scaptocoris castaneus*, 4422
*Schistocerca americana americana*, 1872
*Schizandra chinensis*, 2871
Scion rooting, 1831, 2365
*Scirpophaga nivella*, 3676
*Scirpus* spp., control, 3727
*Scirtothrips citri*, 798
*Sclerospora* spp. on sugar cane, 4407, 4408
*Sclerotinia*—
  *fructicola*, 293, 294, 1300, 1347, 2464, 3614, 3615
  *fructigena*, 1435 l, 3613
  *laxa*, 295, 1347, 1417
  *libertiana*, 4008
  *sclerotiorum*, 488, 2642, 3902, 3956k, 4051
  spp., manual on brown rot fungi, 3612
  *vaccinii-corymbosi*, 2458
*Sclerotium*—*see also* Damping off—
  *bataticola*, 615k, 3054
  *delphinii*, 4081
  *rolfsii*, 675, 3058, 3943, 4051, 4465
*Scopolia carniolica*, 1717
Scoresby hort. Res. Stat., Victoria, Aust., 2215, 3469
Scotland—*see under* Great Britain
Seakale growing in New Zealand, 406
Seaweed, agar from, 4066
Seaweed utilization in Indonesia, 614
*Sechium edule*, 543g
Seed(s)—*see also* Embryo *and individual plants*—
  after-ripening, 3459, 4141
  -borne diseases, 2698, 2838n
  cleaning, 2869, 3438
  disinfection—*see below under* treatment
  dormancy breaking, 4141
  drills, 4490
  endosperm in cucurbits, 1647f
  formation in seedless fruits, 762
  germination—*see also below,* testing *and* treatment—
    carbon dioxide and oxygen affect, 417
    chemical processes during, 3392, 3396, 3444i
    colour-printed seed packets affect, 2633
    cotyledons' role in, 3461
    endosperm's role in, 3459
    inhibitors of, 37, 1615, 2173
    light affects, 416, 444, 1614, 2162
    media for vanilla, 4005
    plastic containers and covers for, 2204
    pollen parent affects, 1194
    in saturated atmosphere, 619, 1748
    sawdust affects, 1569
    symbiotic fungi aid, 4005
    temperature affects, 4031
    viviparous, 3180
    of weeds in India, 3719
  inspection—*see below*, testing
  Path., Danish Plant Serv. for, A.R., 1061f
  production—
    bean, 3769
    beetroot, 3769, 3886
    brassicas, 4472
    cabbage, 1530, 3769, 3800, 3811
    in Canada, 3769
    carrot, 2766
    cauliflower, 1526, 3769
    cherry, 2242
    flower crops, 3011r
    leek, 3769
    lettuce, 3769
    onion, 1594, 2750
    pea, 1047, 2684, 2838x
    radish, 4472
    squash, 2673
    swede, 1609
    tobacco, 1657
    turnip, 1609, 3769
    vegetable, 1493, 2838u
  quality, 2924, 3841

Seed(s) (*continued*)—
  reserves, minor element, plant growth affected by, 466
  storage, 650, 1014, 1041, 1057, 1658, 2322p, 2335, 2632, 2633, 4031, 4490
  testing—
    in Great Britain, 2634
    a manual on, 1035
    methods, 1570, 1822, 3011n
    Stat., Danish, A.R., 1061g, 3323d
  threshing, machines for, 1647s, 4056, 4061
  treatment—*see also above*, germination—
    with abrasives, 3003
    with acetone, 2745
    with alcohol, 2745
    with bromine water, 1647d
    with cold water—*see below*, pre-soaking
    with electrons, 3334
    with fungicides and bactericides, 421, 459, 460, 619, 1002, 1748, 1774
    with glucosides, 2159
    with growth substances, 561, 3027, 3386, 3845
    with high-frequency vibrations, 3371
    with hot air, 424, 1801
    with hot water—*see below*, pre-soaking
    with infra-red rays, 1744
    with insecticides, 1583, 1584, 1599, 1604, 1607, 2759, 3686, 3894
    machines for disinfection, 422
    methods, general, 422
    pelleting, 1494, 3771
    pre-soaking, 424, 703, 1801, 1810, 2171, 2997, 4141
    seed coat removal, 703
    with short-wave radiation, 424
    stratification, 108, 703, 717, 1167, 1168, 2241, 2925, 2997, 4141
    with sulphuric acid, 703, 1810, 2997
    with supersonic radiation, 424
    with ultrasonic vibrations, 3371
    for weed seed destruction, 1463
  vernalization—*see* Vernalization
*Selenaspidus* spp., on *Euphorbia*, 4162q
*Senecio glabellus*, 615a
*Senecio riddellii*, 615b
Senescence in citrus trees, 778
*Septoria*—
  *depressa*, 1864
  *digitalis*, 4008
  *lycopersici*, 1643
  sp. on citrus, 1912a
*Septoriella oleae*, 1905
*Serenoa repens*, 4068x
Sesame, growth substances affect, 2691
*Sesamia vuteria* (=*S. calamistis*), 991, 3237
*Sesbania*—
  *aegyptiaca*, 1853, 2641
  *grandiflora*, 3143
  *speciosa*, 1015, 3143
*Setaria viridis*, 3721
Sewage sludge as a manure, 414
Sewage water for irrigation, 1131
Seychelles, coconut growing, 1016p
Seychelles Dep. Agric., A.R., 1061p
Shade—*see also* Light—
  artificial, light intensity and temperature under, 69, 70
  artificial, materials for, 3429
  for cacao, 866, 1937, 1938, 1948, 1949
  for carnation, 1753
  for citrus, 1824, 1850
  for coconut, 3143
  for coffee, 1986, 1987, 3159, 4327, 4329, 4333, 4340, 4341
  density measurement, 2164
  for tea, 1005, 3251, 3269p
  for tobacco, 562, 1664
  trees and plants—
    *Acacia* spp., 4333
    *Albizzia maranguensis*, 4333
    *Albizzia moluccana*, 1005
    Conference, nat., combined Proc., 4494g
    *Cordia holstii*, 4333
    *Croton mubango*, 4327
    *Desmodium ovalifolium*, 4329
    *Erythrina* spp., 1987
    *Eucalyptus intertexta*, 735h
    *Grevillea robusta*, 1005
    heart rots of, 2448
    *Hevea* spp., 4327
    *Indigofera endecaphylla*, 4329
    *Macaranga monandra*, 4327
    in Malaya, 1937
    *Phialodiscus discoideus*, 4327
    root rots of, 4340, 4341
    *Sesbania speciosa*, 3143
    *Terminalia superba*, 4327
    *Tithonia* sp., 2067
Shallot—
  diseases, 1597, 3882, 3885
  pests, 3885
  storage, 2751
Shelter belts—*see* Windbreaks
*Shorea* spp., oil plants, 4068h
Shrubs—*see* Ornamentals, coniferous *and* woody
*Sida cordifolia*, 1720
Sierra Leone Dep. Agric., A.R., 1061q, 4494j
Sieve tubes, development, 1813f
Silicates in plant nutrition, 3926
*Silybum marianum*, 2141
*Simaethis nemorana*, 89
*Simplinychus buxi*, 4145
Sisal—
  growing in Angola, 3299
  nutrition, 594, 1917
  research—
    in the Belgian Congo, 3104
    in Kenya, 3303
    in Mauritius, 3307
  wax, 2894
*Sitona lineatus*, 542 l, 4483
Sloe seed stratification, 108
Slugs and their control, 340, 355, 626, 1411, 3444a
Small fruit—*see also separate crops*—
  grading, 77

Small fruit (*continued*)—
  growing in Great Britain, 1295h
  nutrition, 2395b, 4453
  soil management, mulching, 55
  soil management, weed control, 2590
  varieties in Canada, 1042
  varieties in the U.S.A., 3572c
Smog—*see* Air pollution
Snails and their control, 735g, 918, 1411, 3444a
Snapdragon—
  diseases, fungus, 1647p, 1647q, 2643, 2951, 3944, 4097
  diseases, iodine treatment for, 2182, 2643
  flower, nectar production, 1127
  flower pigments, 2950
  nutrition, 2948
  polyploid, 3011k
  seed germination, 619
  sub-irrigation, 2949
  tricotyledonous, 653
  varieties, 2622, 4078
Society chem. Ind., Rep., 248, 1052
Sodium—*see also* Salts—injury to avocado, 745, 3015
Sodium nutrition of plants, 42, 3015, 4204, 4221
Soft fruit—*see* Small fruit *and individual crops*
Soil(s)—
  blocks—*see* Pot
  conditioners—
    krilium (CRD 189), 54, 637, 3443h, 3776
    lignin, 2188
    new, 1126
    polyacrylnitrile, hydrolysed, sodium salt of (HPAN), 1125
    reviews on, 1124, 3415
    vinyl acetate-maleic acid (VAMA), 411, 1125
  (and water) conservation—*see also* Planting, contour—for—
    coffee, 3158
    pineapples, 3183
    tobacco, 550
    vines, 3572k
  cover, glass as a, 2800
  disinfection with antibiotics, 4081
  fertility, pot tests for, 2052, 2079f, 3220, 4376
  flooding—*see* Flooding
  fumigation—*see* Fumigation *and below*, sterilization
  fungi, antagonism between, 3944
  fungi, pathogenicity, factors affecting, 3786
  heating by—
    calcium cyanamide+straw, 446
    electricity, 66, 1058
    hot water pipes, 1496, 1497
    infra-red radiation, 65
    waste heat, 1496, 1497
  of Holland, 79w
  indicator, coffee seedlings as, 907
  micro-organisms, herbicides affect, 2621h
  moisture—
    measurement, 161, 2208i, 2814, 3222, 3918
    response of—
      fruit trees, 154
Soil(s)—moisture—response of (*continued*)—
      tobacco, 1669, 3977
      tomato and pepper, 3916
      vegetables, 1647h
    transpiration affected by, 1834
  nitrification in mulched, 159
  nitrification in sterilized, 2644
  pH, mineral deficiencies and, 1121
  pH, plant requirements, 706
  potting, 620, 4163f
  salinity—*see also* Salt—treatment of, 51
  sampling, an auger for, 1307
  sampling in vineyards, 1295i
  sickness—*see also* Replanting—24, 258, 1306-1308, 3304, 3581, 3582
  sterilization—
    equipment, 79e, 1517
    by herbicides—*see* Herbicides, soil sterilants
    by steam, 52, 53, 542f, 1517, 1518, 2187, 2644, 2788
  survey of East Malling Res. Stat., 3443f
  temperatures, 467
  and water conservation—*see above*, conservation
Soilless culture—
  apparatus for, 3987
  of azaleas, 618
  in Belgium, 79v
  books on, 2093
  of carnations, 2934, 3011v
  of cucumbers, 3828
  for herbicide studies, 1439
  of mushrooms, 2715
  for nutritional studies, 47, 741, 745, 821, 867, 868, 2273, 2810, 2948, 3401, 3402, 3407, 4197, 4198, 4360, 4379
  oxygen supply in, 2929
  of pot plants, 2929, 4075
Solanaceous plants, diseases, virus, 3950
*Solanum*—
  *dulcamara*, 495
  *hyporhodium*, 4264u
  *muricatum*, 3949
  *nigrum*, 3719, 3955p
  spp. mycorrhizae, 2838w
  *torvum*, 3947
*Solenopsis saevissima*, 2654
*Sonchus* spp. control, 1485i
*Sorbus* spp. as food plants, 2322e
*Sorbus* spp. as pear rootstocks, 1176
*Sorghum halepense*, 1460, 1474, 1476, 1485f, 2569, 2570, 3718, 3722, 3742
Soursop (*Annona muricata*), 2076
South—
  Africa—
    apple growing, 117, 1161
    banana growing, 2078z
    chicory growing, 1701, 1742h
    cucurbit growing, 542n
    Dep. Agric., A.R., 3314
    diseases in, 245
    Div. Ent., A.R., 3315
    Div. Hort., A.R., 2622

- South—Africa (*continued*)—
  - fruit growing and research, 2211, 2216, 3539m
  - papaw growing, 1017c
  - passion fruit growing, 1907
  - pineapple growing, 4355
  - sugar cane growing and research, 963, 1016c, 2038-2040, 2079m, 4370, 4447e
- Pacific territories, crop prospects, 2078p
- Southern Rhodesia—*see* Rhodesia
- Spacing—*see individual crops under* planting *or* spacing
- Spade—*see under* Tools
- Spain—
  - castor bean growing, 2906
  - citrus growing, 1912i, 4217, 4227
  - olive growing, 1893, 4265e
  - register of plant varieties, 2128
  - rubber plants growing, 2902
  - vine growing, 2346
- *Spartium junceum*, 615 l
- *Spathoglottis* orchids, 3011u
- Spearmint—*see under* Mint
- Spectrographic analysis and spectrography, 2208f, 3444j
- *Sphaceloma rosarum*, 1789
- *Sphaeropsis pseudo-diplodia*, 1337
- *Sphaerotheca pannosa*, 3617
- Spices, extraneous filth in, 2869
- Spices, production and trade, 1914
- *Spilonota ocellana*, 1424
- Spinach—
  - bolting, 2781
  - chloroplasts, 1647a
  - climate, smog damage, 45, 1083
  - climate, temperature response, 2781
  - composition, 1145e, 1616, 3413, 3780, 3907
  - diseases, fungus, 2783
  - diseases, resistance, 1509
  - growing under glass, 492, 493
  - growing in Great Britain, 3956f
  - herbicide injury, 2784
  - New Zealand (*Tetragonia expansa*), 2744, 3956f
  - nutrition—
    - carotene content affected by, 3413
    - chloride and sulphate, 3906
    - manuring, 1501, 1616
    - nitrogen, 2640
  - pests, insect, 2653, 3787
  - photoperiodic response, 2781
  - processing, 408
  - seed treatments, 2782
  - soil management, weed control, 2561, 3755
  - varieties, 408, 492, 4480
- Spinach-beet—
  - growing in Great Britain, 3956f
  - nutrition, 2763, 3777
  - pests, 1521
- *Spiraea* nutrition, 252
- *Spondias tuberosa*, 3278
- Spray(s) (ing)—*see also* Acaricides, Fungicides, Growth substances, Herbicides *and* Insecticides—
  - by aircraft, 372x, 2530-2532, 3439, 4465
  - apparatus—
    - automatic, for bush fruit, 362
    - centrally-operated, high pressure, 2534
    - for low volume applications in the field—*see also below*, concentrate—364, 373d, 2535, 3687, 3688, 3690r
    - nozzle types, 2201
    - "rain-gun", 2475
    - a review, 372q, 3287
    - for vineyards, 2475
  - for blossom thinning—*see* Thinning
  - concentrate—*see also above*, apparatus for low volume—177, 178, 292, 363, 364, 1058, 1433, 1435d, 2450, 2534, 2539, 3634, 3690e, 4490
  - damage—*see below*, injury
  - deposits, evaluation of, 369
  - droplet—*see below*, particle
  - foliar—*see* Nutrition, foliar
  - for fruit drop prevention—*see* Fruit drop
  - fruiting in ornamental trees prevented by, 4142
  - for hop stripping, 2898
  - hormone—*see* Growth substances
  - injury to—
    - apple—*see* Apple
    - bees, 1427, 3678
    - cherry, 363, 4483
    - citrus, 1879
    - plants, factors affecting, 1415
  - mixtures, general purpose, 3670
  - particle size—
    - of dispersible powders, 366
    - and distribution, determination of, 366, 368, 2536-2538
    - optimum, 2539
  - programmes for citrus, 4219
  - programmes for deciduous fruits, 1299, 2545y, 2545z, 2546b, 3690d
  - residues—*see also particular crops and types of sprays*—
    - in foods, 2540, 2541
    - on fruits, mechanical removal of, 536
    - on plants and their determination, 371, 2542, 3100o, 3679, 3680, 3685, 3689m, 3690h, 3690i, 3788, 3955g
    - in soil, 2544
- Squash—*see also* Cucurbits—
  - composition, 543p
  - growing in South Africa, 542n
  - nutrition, 2676
  - pests, 3787
  - seed germination, 444
  - seed production, 2673
  - varieties, 2838v
  - weed control, 2612
- Squirrel—*see under* Rodent
- *Stagonospora curtisii*, 4109
- *Stagonospora sacchari*, 988-990, 3235, 4409
- Starch metabolism, 1145j

*Statice* diseases, 1764
Statistical—
  analysis of trials, 531, 1017p, 1021, 1145f, 2131, 2553, 3345, 3346, 3351, 3443e, 3444f, 4365, 4460
  calculation of rainfall expectation, 2189
  design of trials, 79s, 950, 954, 966, 1021, 1232, 1468, 1487, 2132, 3339-3344, 4453, 4460
  sampling, 608, 806, 1960, 2134, 3486, 4365, 4397, 4413, 4447j
Statistics, agricultural, 1053, 1078, 3324, 3325, 4488
*Staudtia gabonensis*, 4065
*Stemphylium*—
  *botryosum*, 3905
  *radicinum*, 488
  *solani*, 3932, 3955m
*Stephanitis globulifera*, 4143
*Stephanitis rhododendri*, 3011t
*Stephanoderes hampei*, 3676, 4344
*Stereum purpureum*, 373b, 373c
*Sternbergia lutea*, 684
Sterols, plant, a review, 4068e
*Stigmaeus floridanus—see Dolichotetranychus*
*Stizolobium aterrimum*, 1015
Stock (*Matthiola* spp.)—
  diseases, 1608, 2953
  double flowered, 1765, 2952
  salt injury, 2953
Stockbridge House exp. Hort. Stat., work at, 4479
Stomata, measurement of, 2228
Stomatal guard-cells, 2161
Stomatal movements, 19, 1099, 1100, 3153
Stone fruits—*see also separate fruits*—
  blossom bud development and frost resistance, 1186
  diseases—
    bacterial, 2447
    in Uruguay, 2545v
    virus, 3591, 3599, 4490
  pruning, 2298
  seed, oil-cake from, 2322o
Storage—*see also separate crops*—
  buildings or chambers—
    air conditioned, 1135, 1136, 1778
    air purification in, 1229, 1230, 2317
    cold, 2315
    humidity control in, 3337
    ice houses, 2315
    temperature controlled, 3321
  coatings, 1225, 1226
  cold, Louis Morard Res. Inst., Algeria, 2121
  cold, a review, 1236m
  of cuttings or budwood, 628, 4082, 4087, 4292, 4373
  dips—*see also above*, coatings—78, 195, 197, 198, 801, 1885, 1886, 1930, 2003, 3069, 3673, 3819, 4246
  flower—*see* Flowers, cut
  fruit—
    chilling injury, 3368
    cold, 1228, 1236m, 2315, 2316
Storage—fruit (*continued*)—
    disorders, reviews on, 2316, 3368
    gas—*see below*, gas
    growth substances prolong—*see* Growth substances, fruit storage
    a review, 2322q
    rot control—*see also above*, dips, *and below*, wraps—308
  gas, 196, 217, 802, 1224, 2319, 3304, 3445, 3522, 3531, 3539j
  liners, plastic, 628, 679, 1227
  moss, 2322f
  pests, control, 1080, 1375, 2705
  pollen, 2208o, 2256, 2746, 3338
  seed—*see* Seed storage
  vegetable—*see also particular vegetables*—78, 2315, 2322q, 2635
  wraps, 294, 1819, 1885, 1886, 2383, 3072, 3530, 4245
Storrs agric. Exp. Stat., Conn., A.R., 1061e, 2097
Strain, horticultural definition of, 3349
Stratification—*see* Seed treatment
Strawberry—
  anatomy, stolon, 3548
  breeding, 208, 2332
  certification, 3574
  climate, frost protection, 1128, 1314
  climate, spring frost damage and resistance, 3551
  composition—
    fruit and juice, 209, 213, 1211, 1251
    leaf, 1253, 2339, 2411, 3555, 3778
    plant, 2330
  diseases—
    fungus—
      grey mould (*Botrytis cinerea*), 303, 2468, 3619, 3620, 3674
      leaf blight (*Dendrophoma obscurans*), 304
      leaf blotch (*Zythia fragariae*), 2470
      leathery rot (*Phytophthora cactorum*), 1354
      red core or red stele (*Phytophthora fragariae*), 208, 1246, 1295e, 1353, 2469
      ripe fruit rot (*Gloeosporium* sp.), 3621
      root rots (various organisms), 2330, 2468
      wilt (*Verticillium* sp.), 247
    virus, 247, 276, 277, 372t, 372z, 2112, 2436, 3600, 3601, 3690 l
  everbearing, 244a, 2333, 2338
  flower—
    bud initiation, 2334, 2336
    phyllody, 2436
    removal, 2341
  forcing, 214, 215, 2337, 2395g
  fruit—*see also above*, composition—
    flavouring materials in, 1242
    production of autumn, 2395i
    quality, nutrition affects, 213
    yield uniformity trials, 2132
  growing—*see also below*, varieties—
    in Australia, 4482

Strawberry—growing (*continued*)—
    in Austria, 3572q
    in Belgium, 244c, 3539g
    under cloches, 1245
    everbearing, 244a, 2338
    in Germany, 1034
    in Holland, 215, 2395i
    in Japan, 3768
    in Latin America, 1250
    a manual on, 1034, 1243
    in the U.S.A., 3554
  growth studies, 212, 3547
  labour requirements, 1489
  leaf growth studies, 212, 3547
  leaf removal after cropping, 1254, 3553
  mycorrhiza, 3355
  nutrition—
    calcium, 50
    chloride, 2411
    foliar, 2342, 4480
    leaf analysis a guide to, 3778
    manuring, 213, 1252, 1253, 2339, 3555
    a review, 4453
    salt tolerance, 2413
  perpetual—*see above*, everbearing
  pests—
    aphids (*Pentatrichopus fragaefolii*), 3600
    *Cladius pectinicornis* and *Emphytus cinctus*, 2545b
    meadow spittlebug (*Philaenus leucophthalmus*), 2498
    mites (*Tarsonemus* and *Tetranychus* spp.), 313, 1372, 1399, 2490
    nematodes, 309, 1369, 1370, 2343, 2648
    omnivorous leaf tier (*Cnephasia longana*), 2498
    *Rhogogaster viridis*, 343
    root weevils and white grubs (*Otiorrhynchus* or *Brachyrhinus* spp., etc.), 1381, 1382
  photoperiodic response, 214, 1057
  planting stock production, 244b, 2343
  planting systems, 2338, 2340, 3553
  processing, juice, 3539k
  research—
    at Botley Fruit Stat., 1246
    at Kentville, N.S., 207
    at Lausanne, 1044
    in the U.S.A., 2101
  runners—
    formation and development, 2334, 3548
    formation, growth substances affect, 216, 388, 2342
    hot water treatment, 1370
  seed viability, 2335
  soil management—*see also above*, nutrition *and* planting—
    crop rotation, 2330
    irrigation, 3553, 4475
    mulching, 55, 207, 2330, 2338, 3416
    post-harvest treatments, 1254, 3553
    weed control, 375, 387-389, 1479, 2593-2597, 3708, 3753, 4490
  storage, gas, 217
Strawberry (*continued*)—
  variety(ies)—*see also above*, growing—
    in Algeria, 1249
    in Austria, 209
    in Belgium, 3550
    in Canada, 1048, 2330
    characters, regional variations in, 1251
    in Cyprus, 2098
    disease resistant, 1295e, 2469
    Finn, Julia and Landia, 2331
    in Germany, 210, 1243, 3540
    in Holland, 211, 1647c, 3572r, 4480
    in Japan, 3549
    Jucunda, 4472
    in Norway, 1247
    for processing, 218
    Saint Claude, 2333
    Senga-Sengana, 3551
    in Sweden, 2331
    in the U.S.A., 276, 1159, 1248, 2106, 3458, 3572b
    in the U.S.S.R., 1251, 2340
    Wädenswil 5, 3552
*Strelitzia reginae*, 685
*Streptomyces scabies*, 4465
*Strombosia grandiflora*, 4065
Strontium absorption and translocation, 1119
*Strophanthus*—
  *sarmentosus* growing in Florida, 4013
  spp.—
    in Angola, 2922g
    as medicinal plants, 587
    pollination, 4013
*Strumeta tryoni*, 4264q
*Strychnos* spp. in British Guiana, 4014
*Stylophorum franchetianum*, 2876
*Stylosanthes gracilis*, 1015
Subtropical fruits in Egypt, 4264j
Subtropical fruits in Florida, 4264t
Succulents, physiology, 4162p
Sucrose—
  cell enlargement affected by, 2140
  sprays for tomato, 504, 2805
  synthesis in plants, 4003e
  translocation in plants, 40
Sudan—
  flora, 4494b
  diseases of fruit and vegetables, 1033
  Minist. Agric. Res. Div., A.R., 2119j, 3312
  weeds, 3759a
Sugar—
  *Association Handbook, British West Indies*, 3198
  cane—*see below*, Sugar-cane
  content of plants, seasonal changes, 3393
  determination in plants, 80i, 1211, 4275, 4360, 4438
    maple—*see below*, Sugar-maple
  programme in the U.S.A., 3200
Sugar-cane—*see also Saccharum*—
  arrowing—*see below*, flowering
  books on the culture of, 1020, 3285

- Sugar-cane (*continued*)—
  - breeding—*see also below*, seedlings *and* varieties—in—
    - Australia, 3270 l, 4446k
    - Barbados, 4366, 4367, 4461
    - India, 3300
    - South Africa, 1016j, 4370
    - the U.S.A., 4392
  - by-products, 1017m, 2065, 3242, 3270t, 4447d
  - climate—
    - drought effects, 4447y
    - frost resistance and injury, 4395, 4490
    - temperature effects, 2048
  - composition—*see also below*, juice *and* sucrose—
    - fibre, 2079 l, 4447n
    - irrigation water affects, 4387
    - leaf—*see below*, nutrition
    - nitrogen, 3270k
    - organic acids, 1055, 4425
  - crop-logging, 3213
  - diseases—
    - bacterial, leaf scald (*Xanthomonas albilineans*), 986, 4398, 4401
    - cause uncertain, leaf rot, 982
    - in the French colonies, 1016h
    - fungus—
      - brown rot (*Cercospora longipes*), 1057
      - leaf scorch (*Stagonospora sacchari*), 988-990, 3235, 4409
      - red rot (*Physalospora tucumanensis*=*Colletotrichum falcatum*), 4404, 4405, 4421
      - root rot (*Pythium* spp.), 3236, 4406
      - sclerospora disease (*Sclerospora macrospora?*), 995, 4407, 4408
      - smut (*Ustilago* sp.), 2058
      - sooty mould (*Meliola* sp.), 4421
      - yellow spot (*Cercospora kopkei*), 4403
    - insects disseminate, 987
    - non-parasitic, stem-gall, 4447y
    - in the U.S.A., 3291
    - virus—
      - chlorotic streak, 839, 4398-4400, 4410
      - Fiji disease, 1017f
      - mosaic, 2055, 3269a, 3269d, 3269s, 4402, 4410
      - ratoon stunting, 983-985, 2056, 2057, 3233, 3234, 4398
  - economics—*see also below*, payment systems—3226, 3228, 4364
  - field trials, design, 966, 4365
  - flowering, 2078i, 3208, 4372, 4391
  - growing—*see also below*, research *and* varieties—
    - in Australia, 2078u, 3285
    - in the Belgian Congo, 4446c
    - books on, 1020, 3285
    - in British Guiana, 4268
    - in British Honduras, 4464
    - in Colombia, 2041
    - in East Africa, 2078d
    - in Egypt, 4447w
- Sugar-cane—growing (*continued*)—
    - in Hawaii, 2036
    - history, 4447a
    - in India, 3270i
    - in Jamaica, 4446t
    - in Madagascar, 1016o
    - in Puerto Rico, 4364, 4447m
    - in Réunion, 1016q, 4446v
    - in South Africa, 1016c, 2039, 2040, 2079m, 4363, 4447e
    - in Trinidad, 3226
  - growth—*see also below*, physiology *and* ratooning—
    - malformations, 981, 4372
    - substance affects, 4396
  - harvesting—*see also below*, maturity—
    - burning to assist, 4424
    - labour efficiency, 3228
    - leaf killing to assist, 2063
    - machinery, 978, 979, 2061, 3229, 3230
    - time of, 3208, 4386
    - topping, 980
  - juice—*see also above*, composition—analytical studies, 4426
  - juice quality, factors affecting, 4387, 4390
  - leaf killing prior to burning, 2063
  - leaf weight, a guide to nutrition, 4375
  - machinery—*see also above*, harvesting—978, 2039, 2047, 2079, 3227
  - maturity—*see also above*, harvesting, *and below*, sucrose—estimation of, 3209, 4365, 4397
  - mill for processing samples, 4365
  - nutrition—*see also above*, composition, *and below*, soil management—
    - calcium, 975, 2052, 3220, 4377
    - factory wastes for, 2049
    - fertilizer drills for, 2079i
    - fertilizer placement, 3219, 4376
    - foliar, 3214
    - leaf analysis a guide to, 1016e, 3210, 3211, 3213, 3217, 3219, 3269w, 4384
    - manuring, 969, 972, 974, 1016a, 1017b, 2050, 2054, 3199, 3210, 3212, 3213, 3215, 3216, 3219, 3313, 4380-4384, 4386, 4446g, 4446y, 4447x
    - nitrogen, 965, 2048, 2051, 2053, 3213, 3216, 4374, 4377-4379, 4386, 4461
    - phosphorus, 2051, 2053, 3217-3221, 4374, 4376, 4377, 4379, 4446i, 4461
    - physiology of, 3214
    - potassium, 1016g, 2051, 2052, 3213, 3217, 4374, 4377, 4379, 4461
    - salt tolerance, 3232
    - soil analysis a guide to, 3210, 3211, 3217, 3269w
    - vegetative index a guide to, 4375
  - payment systems, 997
  - pest(s)—
    - aphids (*Aphis maidis*), 4410
    - borers—
      - *Chilotraea infuscatellus* (=*Argyria sticticraspis*), 993, 4476
      - *Diaprepes* spp., 4411, 4447u, 4447z, 4461

- Sugar-cane—pest(s)—borers (*continued*)—
  - *Diatraea* spp., 987, 991, 992, 994, 3239, 3240, 4410, 4414-4416, 4447u, 4461
  - *Emmalocera depressella*, 993
  - *Heteronychus* and *Hoplochelus* spp., 991
  - *Podischnus agenor*, 4418
  - *Rhabdoscelus obscurus*, 4420
  - *Scirpophaga nivella*, 3676
  - *Sesamia* spp., 991, 3237
- control, biological, 3237, 3300, 4447u
- control of soil, 3238, 4412
- diseases disseminated by, 987
- *Lachnosterna* spp., 4411
- leafhopper (*Pyrilla* spp.), 2059, 3676, 4419
- leafhopper (*Saccharosydne saccharivora*), 4421
- mealy bug (*Trionymus sacchari*), 2060
- nematodes, 995
- rats and mice, 996
- sampling to estimate intensity of attack, 4413, 4447j
- *Scaptocoris castaneus*, 4422
- termites, 4417
- in the U.S.A., 4410
- white grub (*Clemora smithi*), 3237, 4413, 4447u
- white grub (*Phyllophaga* sp.), 4411, 4447z
- yields affected by, 3238, 4412, 4416
- physiology—*see also above*, growth—
  - photoperiodic responses, 981, 2078i, 4390, 4391
  - respiration, 4379, 4423
  - temperature responses, 2048
  - translocation of nutrients, 3214
- planting—*see also below*, setts—
  - machines for, 3227
  - seedlings, 970
  - spacing, 972, 2046
  - time of, 971
- pollen morphology, 2078n
- pollination, 2078i, 4393, 4446o
- production and trade, 1914
- quarantine in Hawaii, 4447f
- ratooning, 4386
- research in—
  - Australia, 2037
  - British Guiana, 4446h
  - the British West Indies, 836
  - Ceylon, 833
  - Cuba, 3197
  - Hawaii, 2035
  - India, 2108, 4476, 4477
  - Kenya, 3303
  - Madagascar, 4273
  - Mauritius, 965, 3270b, 4362
  - South Africa, 2038
  - the U.S.A., 2101
  - Venezuela, 2042
- ripening—*see above*, maturity, *and below*, sucrose
- seed storage, 1057
- seedlings, planting, 970
- setts—*see also above*, planting—
  - fungicides treatment, 2078b, 4446j
- Sugar-cane—setts (*continued*)—
  - germination, factors affecting, 4373
  - lime-water treatment, 971
  - selection, 965
  - storage, 4373
- shaving, 4389, 4490
- soil—
  - fertility, pot tests for, 2052, 2079f, 3220, 4376
  - management—*see also above*, nutrition—
    - cultivation, inter-row, 965, 4386, 4388
    - cultivation, sub-soil, 2045
    - green manuring, 2078t, 4385
    - intercropping, 973
    - irrigation, 2078s, 3213, 3222-3224, 3269c, 3269v, 3270a, 3270f, 4386
    - rotations, 2044, 4446b
    - trash disposal, 965, 2049, 2064, 3231
    - weed control, 396-399, 965, 1473-1477, 1485f, 2548, 2558, 3199, 3706, 3741-3745, 3759n
  - moisture requirements, 976
  - temperature responses, 2048
  - types, 1017u
- stalk, deterioration after burning, 4424
- stalk, rind hardness, 4394
- standover cane, 2062
- storage of harvested, 4423
- sucrose—
  - content, daylength affects, 4390
  - content, temperature affects, 971
  - effects of 2,4-D on, 977, 4396
  - Java ratio, fibre in relation to, 3209
  - sampling and measurement, 4365, 4397
- Tech., Proc. Congr. int. Soc., 3196
- trash—*see above*, soil management
- trials, design of, 966, 4365
- variety(ies)—*see also above*, breeding *and* growing—
  - in Angola, 3299
  - in Australia, 2079b, 2079k, 3201, 3202
  - in Barbados, 4366, 4367
  - in Brazil, 4414
  - in British Guiana, 969, 986, 4368, 4446g
  - cold resistant, 4395, 4490
  - in Colombia, 3311
  - in Cuba, 3207
  - disease resistance in, 4398, 4399, 4403
  - in the Dominican Republic, 4446y
  - fertilizer responses of, 4382
  - in Formosa, 968, 1017s, 4394
  - in Kenya, 3303
  - in Mauritius, 3199
  - for mechanical harvesting, 4490
  - new, methods of evaluating, 4369
  - in Pakistan, 3203, 3204
  - in the Philippines, 1017b, 2043, 3205, 4371
  - in Puerto Rico, 3206, 3269a
  - in Réunion, 967
  - in South Africa, 963, 4370
  - in Trinidad, 964, 1016a, 3313
- vegetative index, 4375
- wax—*see also above*, by-products—1016n, 2078y

- Sugar-cane (*continued*)—
  - yields, 963, 3225, 4375, 4412, 4416
- Sugar-maple diseases, 2919
- Sugar-maple production in the U.S.A., 577d
- Sulphate *vs.* chloride-containing fertilizers, 1501, 3906
- Sulphur—*see also* Fungicides—
  - data, a book on 4455
  - deficiency in fruit crops, 4453
  - dioxide, use in cold storage, 2384
  - dioxide, injury to plants, 44
  - nutrition of—
    - avocado, 4169
    - citrus, 3042
    - tea, 3251
    - tobacco, 1668
    - tomato, 2629
  - toxicity, 4169
- Sumac—*see Rhus*
- Sumatra—*see under* Indonesia
- Sun—*see also* Climate—burn injuries to plants, 577a
- Sunflower—
  - diseases, 3937
  - growth substances affect, 2691, 3379
  - as rootstock for *Xanthium* sp., 409
- Super-cooling studies, 1852, 4218
- Swede pests, insect, 3900
- Swede seed production, 1609
- Sweden—
  - plant breeding, 2226
  - strawberry varieties, 2331
  - vegetable variety trials, 3762
- Sweet pea, seed vernalization, 3358
- Switzerland—
  - agricultural yields and prices, 3443p
  - fruit grading, 201q
  - fruit growing, 2212
  - peach growing, 1150
  - vine growing, 2356, 2395q, 3566
- Sycamore, root growth, 2988
- *Synanthedon pictipes*, 3648
- *Synoxylon* sp. on fig, 89
- *Syntomaspis druparum*, 3335
- Syria—
  - citrus growing, 832c
  - olive growing, 1894
  - pistachio growing, 1292
- *Syringa—see* Lilac

- *Taeniothrips simplex*, 735q
- *Tagetes erecta*, 3374
- *Tagetes patula—see* Marigold
- Tamarind (*Tamarindus indica*), 2079g, 4446w, 4446x
- *Tamarix articulata*, 1853
- Tanganyika Govt Chem., A.R., 4447t
- Tanganyika, papaw growing, 2007
- Tannin(s)—
  - determination, 201v
  - in fruit trees, 3515
  - plant(s)—
    - *Acacia mollissima—see* Wattle
    - in the Belgian Congo, 4065
- Tannin(s)—plant(s) (*continued*)—
    - *Caesalpinia* spp., 842
    - canaigre (*Rumex hymenosepalus*), 1057
    - *Cassia auriculata*, 1740, 4068o
    - in India, 1739
    - *Parkia filicoidea*, 841
    - in the U.S.A., 2868
  - preparation, 1740
- *Taphrina cerasi*, 2460
- *Taraxacum kok-saghyz—see* Kok-saghyz
- *Taraxacum* spp., as weeds of kok-saghyz, 1463
- Tarragon (*Artemisia dracunculus*), 2883
- *Tarsonemus pallidus*, 313, 1372, 1399, 2490
- Tartaric acid determination, 1087
- Tasmania—*see under* Australia
- Tatura hort. Res. Stat., Aust., 81, 3469
- *Taxus baccata*, 611, 703
- *Taxus* spp., diseases, 2995
- Tea—
  - Ass., Indian, Tocklai, a guide to, 3245
  - breeding and selection, 3243, 3244, 4429
  - climate, hail damage, 3258
  - climate, rainfall, 2070
  - clones, 3244, 3248
  - composition—
    - amino-acids, 4439, 4447 l
    - fluorine, 3388
    - mineral, 4436, 4437
    - polyphenols, 4447 l
    - sugars, 4438
  - diseases—
    - algal, red rust (*Cephaleuros parasiticus*), 1012, 3262
    - fungus—
      - blister blight (*Exobasidium vexans*), 998, 1008-1011, 2071, 2072, 3260
      - branch dieback (*Nectria* spp.), 3261
      - root disease (*Fomes noxius*), 4434
  - growing—
    - in Ceylon, 3249
    - in East Africa, 3250
    - hedge system, 2066, 2067
    - in India, 3246, 3254, 4427
    - in Indo-China, 2066
    - in Indonesia, 4428
    - in Malaya, 841
    - in Mauritius, 3252
    - mechanization of, 1006
    - in Papua-New Guinea, 2069, 3253
    - in the South Pacific territories, 2078p
    - in the U.S.S.R., 1001
  - leaf composition—*see above*, composition
  - machinery, 1006, 3254, 3269z
  - manufacture, 2073, 3270j, 4447 l
  - moss and lichen control, 4433
  - nursery technique, 3251, 3257, 3269p
  - nutrition—*see also below*, shade *and* soil management—
    - manuring, 1917, 3251, 4431
    - minor element, 3251, 4437
    - nitrogen, 4430
    - potassium, 4430, 4432
  - pests—
    - ants, 1918

- Tea—pests (*continued*)—
  - *Ceroplastes rubens*, 4435
  - mites, red spider, 999, 1009
  - termites, 3269i
- planting, infilling, 3269q
- planting, spacing, 3251
- plucking, 1007, 3251, 3254, 3255
- production and trade, 1016y, 1914, 3270p
- propagation by cuttings, 1003
- pruning and centering, 1004, 2067, 3251, 3256
- research in—
  - Ceylon, 833, 998, 3247
  - East Africa, 1000
  - India, 999, 1016v, 2068, 3269x, 4494 l
  - Indo-China, 1045, 2067
  - Indonesia, 4272
  - Malaya, 1915
  - Mauritius, 3307
  - Nyasaland, 3251
- Sci. Sect., U.P.A.S.I., A.R., 999
- seed germination, 1002
- shade—
  - in the nursery, 3269p
  - requirements, 3251
  - tree management, 1005
- soil—
  - management—*see also above*, nutrition *and* shade—
    - cover crops and green manures, 3263, 3269j, 3269p
    - irrigation, 3257
    - weed control, 3251
  - requirements and types, 1016k, 3269r, 4436
- spray residues, 3259
- substitutes, 2920
- tasting terms, 4446s
- waste, as a manure, 3300
- Teasel (*Dipsacus* spp.), 1742r, 2921
- Temperature—*see also* Climate, Heat, Soil and Thermoperiodism—
  - factors affecting, 2793
  - measurement in lettuce heads, 2779
  - responses—*see also* Forcing—of—
    - apple, 201m
    - apricot, 2222
    - azalea, 728
    - beans, 463, 2686, 3855, 3917
    - begonia, 657
    - brussels sprouts, 3799
    - cabbage, 432, 3798
    - campanula, 2933
    - carnation, 633
    - cauliflower, 2661, 2663
    - chrysanthemum, 640, 642-644, 2938, 4089
    - cucumber, 3294, 3955q
    - hevea, 952
    - kok-saghyz, 2903
    - lettuce, 2777
    - long-day plants, 2165
    - olive, 3080
    - onion, 475
    - pea—*see also below*, sums—3843, 3845
    - peach, 201m
- Temperature—responses (*continued*)—
  - plants, reviews on, 79m, 3444m
  - spinach, 2781
  - sugar cane, 2048
  - tobacco, 1660
  - tomato, 497, 502, 532, 1627, 1628, 2796, 2802, 3917
  - *Tradescantia*, 1813v
  - tulip, 1795
- under shade, 70
- sums for peas—*see also above*, response—2685
- *Tephrosia candida*, 3269j, 3269p
- *Tephrosia purpurea*, 1015
- *Terminalia superba*, 4327
- Termites and their control, 3065, 3269i, 4264h, 4321, 4417
- *Tetragonia expansa*, 2744, 3956f
- *Tetranychus*—*see also* Mites—
  - *bimaculatus*, 710, 2545m, 2651, 2670, 3626, 3670, 4145
  - *hicoriae*, 1371
  - *lewisi*, 3060
  - *mcdanieli*, 2486
  - *pacificus*, 2486
  - *sexmaculatus*, 3060, 4230, 4264s
  - *telarius*, 530, 543d, 1428, 2487, 2652, 2914, 3830, 4045
  - *urticae*, 2487, 3689b
  - *yumensis*, 3060
- Tetraploid—*see also* Polyploid—plants, 136, 1197, 1742o, 2227, 2229, 2322m, 3965, 4490
- Tetrazolium for gladiolus corm testing, 666
- Thatching, reeds for, 602
- *Theobroma*, gender of, 2078c
- *Theobroma gileri*, 3269g
- *Theraptus* spp. on coconut, 883, 3146, 3147, 4320
- Thermoperiodism, 1092
- *Thielaviopsis basicola*, 1682, 2857-2859, 3008, 4103, 4156, 4490
- Thinning—
  - apple blossom and fruit—*see* Apple
  - apricot blossom and fruit, 178
  - blossom and fruit, concentrate sprays for, 177, 178
  - citrus trees, 764
  - fruits, chemical, physiological effects of, 4489
  - peach blossom or fruit, 176, 4489, 4490
  - pear blossom or fruit, 173, 174
  - plum blossom, 173
  - table grapes, 2373
- Thiouracil, virus inactivation by, 2855, 2856
- Thistle—*see also individual species*—control, 1485i, 3720
- *Thomasiniana*—
  - *oculiperda*, 4077
  - spp. on fruit, 3644
  - *theobaldi*, 372b, 4077
- *Thrips tabaci*, 1687, 1697 l, 2758, 3884
- *Thuja* propagation by cuttings, 1796
- Time and motion studies—*see under* Economics

- Tissue culture, 36, 80c, 80f, 542q, 1143, 1648c, 2145, 2208y, 2845, 3122, 3374, 3888
- *Tithonia*—
  - *diversifolia*, 3746
  - sp. as a cover and temporary shade crop, 1916, 2067
- Tobacco—*see also Nicotiana*—
  - broomrape (*Orobanche* spp.) on, 402, 3758
  - breeding and selection, 555, 1657, 1697b, 2852, 2867a, 3959, 3962, 3963, 4003a, 4482, 4487
  - by-products, 1696, 2646
  - chemistry—*see below*, composition *and* physiology
  - climate—
    - hail damage, 1676, 4490
    - rainfall, 2846
    - temperature responses, 1660
    - wind protection, 562
  - composition—*see also below*, curing *and* physiology—
    - alkaloids, 554, 556, 558, 559, 577f, 1103, 1692, 2847, 3300, 3965, 3969
    - carbohydrates, 1690, 3957
    - enzymes, 17
    - factors affecting, 1669, 1674, 1677, 3957, 4490
    - growth substances, 3382
    - mineral, 544, 2181, 2849, 3997, 3998
    - nitrogen compounds, 1145e, 1690, 1691, 3443o, 3975, 3997
    - phenolic compounds, 1690
    - resins, 1692
  - curing—
    - air, 2865
    - barns for, 2867b
    - chemical changes during, 557, 1693, 2863, 3959, 4000, 4001
    - flue, 576, 1695, 2864, 4000, 4001
    - sulphur dioxide injury, 1694
  - diseases—
    - bacterial—
      - angular spot (*Pseudomonas angulata*), 1678
      - frenching (*Bacillus cereus?*), 1677, 3957
      - Granville wilt (*Pseudomonas solanacearum*), 1512
      - wildfire (*Pseudomonas tabacum*), 1678
    - cause complex, barn spot (physiological and pathological), 3999
    - fungus—
      - black root rot (*Thielaviopsis basicola*), 544, 1682, 2857-2859, 4490
      - black shank (*Phytophthora* spp.), 574, 2859, 3989, 3990
      - blue mould (*Peronospora tabacina*), 573
      - brown spot (*Alternaria longipes*), 1678
      - canker (*Phytophthora parasitica*), 544
      - damping-off (*Pythium* and other fungi), 1683, 1697o
      - frog-eye (*Cercospora nicotianae*), 1678
      - powdery mildew (*Erysiphe cichoracearum*), 570, 571, 1678

Tobacco—diseases (*continued*)—

- non-parasitic—
  - flooding injury, 3979
  - growth substance and herbicide injuries, 1677, 2557
  - hereditary abnormalities, 563
  - sun scorch, 577a
  - trashy leaf, 546, 2851
- in the U.S.A., 3291, 3980
- varietal resistance, 555, 2859
- virus—
  - cucumber mosaic, 3950
  - etch, 3952
  - in Germany, 1679
  - green spot, 569
  - host water supply affects, 1680
  - leaf curl, 1678
  - mahorka tip chlorosis, 1697 l
  - mosaic, 544, 564-569, 572, 1678, 1681, 1697e, 1697j, 2852, 2853, 2856, 3810, 3866, 3950, 3967, 3981-3987, 4003d
  - mottle, 3984
  - necrosis, 572
  - pepper vein-banding, 3950
  - potato Y, 2854
  - ringspot, 3952
  - rosette, 1678
  - tomato spotted wilt, 1697d
  - thiouracil affects, 2855, 2856
  - yellow dwarf, 3957, 3988

- drying—*see above under* curing
- fermentation—*see also above*, curing—in air-conditioned sheds, 1778
- flowering, factors affecting, 1660
- grading, 2840
- growing—*see also below*, varieties—in—
  - Canada, 1070
  - Ceylon, 549, 3961
  - Germany, 2842
  - India, 577b, 577e
  - New Zealand, 1697a, 1697n
  - Rhodesia-Nyasaland Federation, 3962, 4486, 4494h
  - the Sudan, 3312
  - the U.S.A., 548, 577d, 1649, 1650, 1697f
- growth—*see also below*, physiology—
  - BHC stimulates, 3995
  - colchicine affects, 3966
  - indoleacetic acid affects, 36
  - maleic hydrazide affects, 1677
- harvesting, 4489
- leaf—*see also above*, composition—anatomy, 1697g
- leaf, phosphorus recretion by, 2181
- nicotine—*see above*, composition, alkaloids, *and below*, physiology
- nutrition—*see also below*, soil management—
  - disorders of, 2851, 3998
  - foliar, 3974
  - iron, 41
  - manuring, 1666, 1917, 2848, 3959, 3973, 4489
  - molybdenum, 4490

Tobacco—nutrition (*continued*)—
    nitrogen, 1697m, 2847, 2849, 3957, 3972, 3974, 3975
    phosphorus, 2847, 2849, 3959
    potassium, 2847, 2849, 3986
    sulphur, 1668
    virus affected by, 565
  pests—
    budworm (*Heliothis virescens*), 2861, 3994
    in Canada, 1697h
    flea beetle (*Epitrix hirtipennis*), 3992
    hornworm (*Protoparce sexta*), 1686, 3993
    nematodes, 574, 575, 1661, 1662, 1689, 1697i, 1697k, 2648, 2860, 3959, 3980, 3991, 3996, 4490
    *Pentodon punctatus*, 2862
    soil insects, 1662, 1685, 3995
    in Southern Rhodesia, 1684
    thrips, 1687
    in the U.S.A., 3980
    wireworm, 1688
    vegetable weevil (*Listroderes* sp.), 426
  × petunia hybrids, 2867a
  physiology—*see also above*, composition *and* growth—
    enzyme activity and distribution, 41, 577c, 2849
    nicotine synthesis, 1103, 2844, 3968
    nitrogen assimilation, 3975
    organic acid metabolism, 2867c
    photosynthesis, 2154, 3976
    sucrose synthesis, 4003e
    water relations, 1669, 3977, 3979
  planting—
    dates, 1662
    growth substances to aid transplanting, 560, 561
    spacing, 1663, 3957, 3969, 3970
  pollination, 577g, 1670
  production and trade, 548, 577d, 1914, 3326
  propagation by cuttings, 1657, 3988
  quality, factors affecting, 546, 562, 566, 2866, 3957, 3996
  quality, glowing capacity of cigar, 1689
  research in—
    Australia, 2109
    the Belgian Congo, 834, 3104
    Canada, 547, 3958
    Ceylon, 833
    in Cyprus, 1653
    Italy, 3960
    Mauritius, 3307
    New Zealand, 544, 545, 1038, 1047, 2099
    Northern Rhodesia, 1652
    South Africa, 3959
    Southern Rhodesia, 2841
    Switzerland, 1044
    the U.S.A., 2097, 2101
  root system, 1667
  rootstock, tomato as a, 559
  seed—
    -bed management, 401, 1659, 2557, 3959, 3973
    biochemistry, 2844

Tobacco—seed (*continued*)—
    extracts, action of, 4003c
    oil, 4003b
    production, 1657
    storage, 1658
    treatment, 561
  shade, 562, 1664
  soil—
    conservation, 550
    management—*see also above*, nutrition *and* seed-bed—
      cultivation, 2846
      fumigation, 544, 1689
      green manuring, 1665
      irrigation, 164, 2850, 2909, 3978
      mulching, 1665
      rotations, 544, 550, 1661, 1665, 4490
      weed control, 375, 1484, 2557, 3708
    water requirements, 1669, 3977
    waterlogging, 3979
  spacing—*see above*, planting
  statistics, U.S. Dep. Agric., A.R., 548
  stems, compost from, 2646
  suckers, chemical suppression of, 546, 1672-1675, 3971, 4490
  tetraploid, 3965
  tissue culture, 36, 2845, 3374
  topping, 1671, 1673, 1674, 3971
  varieties—*see also above*, growing—
    in Angola, 3299
    aromatic, 553
    in Australia, 551, 1654, 1697b
    in Austria, 1654
    in Belgium, 1655
    disease resistance, 555, 2859
    in Germany, 3963
    in Holland, 1647c
    hybrid vigour, 3964, 3967, 4003a
    in India, 3961
    in Italy, 1656, 4002
    new lists of, 10
    in Nyasaland, 2848
    in Southern Rhodesia, 552
Tocklai—*see* Indian Tea Ass.
Tokai-Kinki hort. Exp. Stat., Okitsu, 5
Tomato—
  breeding—
    for ascorbic acid, 4485
    in Canada, 4475
    for disease resistance, 1510, 1641, 1643, 2838a, 3309, 3909
    for earliness, 3955p
    of tetraploids, 1619
  broomrape (*Orobanche* spp.) on, 2827, 3758
  climate—
    drought effects, 3860
    evapotranspiration, 415
    frost hardiness, 2787
    frost protection, 1313
    fruit composition affected by, 2795
    glasshouse, 2799
    light, artificial—*see also below*, physiology—497-499, 2169, 2797, 2798, 2802, 3430, 3910-3912, 4480

- Tomato—climate (*continued*)—
    - micro-, 1145m, 2793
    - sandstorm damage, 2838 l
    - temperature responses, 497, 502, 532, 1627, 1628, 2796, 2800, 2802, 3917
    - wind damage, 4475
  - composition—
    - fruit—
      - ascorbic acid, 1631, 1632, 2794, 2795, 2807, 2811, 3914
      - carbohydrates, 1627, 2795, 2803, 3931
      - carotenoids, 532, 534, 2803
      - dry matter, 1626, 2795
      - factors affecting, 2787, 2795, 2803, 3924
      - manganese-iron relationship, 3927
      - organic acids, 542a, 1145v, 2803, 3780
      - pH values, 1641
      - pigments, 2106
    - leaf, niacin, 3913
    - leaf, in relation to soil properties, 509
    - plant—
      - chlorine, 2146
      - drought affects, 3860
      - soil cations affect, 768
    - root, 2826
  - diseases—
    - bacterial—
      - canker or wilt (*Corynebacterium michiganense*), 520, 1513, 2443, 2815, 2822, 3783, 3937
      - crown-gall (*Bacterium tumefaciens*), 35, 80h, 521, 3937
      - soft spot (*Bacterium subtilis*), 3938
      - speck (*Pseudomonas punctulans*), 2815
      - spot (*Xanthomonas vesicatoria*), 2815, 3783, 3932
      - wilt (*Pseudomonas solanacearum*), 1512, 2815
    - cause uncertain, root rot, 528
    - fungus—
      - blight, early target spot or collar rot (*Alternaria solani*), 543n, 1059, 1636, 1637, 2819-2821
      - blight, late (*Phytophthora infestans*), 543n, 1623, 2822, 3932, 3933, 3938
      - fruit rot (*Melanconium lycopersici*), 527
      - fruit rot (*Phoma destructiva*), 3933
      - grey mould (*Botrytis cinerea*), 500, 2099, 3932
      - grey leaf spot (*Stemphylium solani*), 3932, 3955m
      - leaf mould (*Cladosporium fulvum*), 543f, 1417, 1638, 2788, 2823-2825, 3939
      - leaf spot (*Septoria lycopersici*), 1643
      - *Sclerotium rolfsii*, 3943
      - stem rot (*Didymella lycopersici*), 522, 523, 2105, 3940
      - in stores, 308
      - wilt (*Fusarium bulbigenum*=*F. oxysporum* f. *lycopersici*), 423, 524, 525, 1639-1641, 2545g, 2826, 3410, 3941, 3942, 4489
      - wilt toxins, 3941, 3942

- Tomato—diseases—fungus (*continued*)—
      - wilt (*Verticillium albo-atrum*), 1647p, 1647q, 3944
    - iodine treatment for, 2182, 2643
    - market, 514
    - non-parasitic—
      - blossom-end rot, 511, 517, 2816
      - cloud, 2817
      - crease-stem, 1634, 2818, 3934
      - hard-core, 515
    - varietal resistance, 515, 543f, 1509, 2826
    - virus—
      - aspermy, 518
      - identification, 543e
      - mosaic, 423, 519, 3935, 3950
      - rugose leaf curl, 3785
      - seed-borne, therapy, 424
      - spotted wilt, 542x
      - yellow-net, 3936
  - economics, 1489
  - flower abnormalities, 2838m
  - fruit—
    - characters, environment affects, 2787
    - colour measurement, 542i
    - flavour, insecticides in relation to, 425, 1647g, 3933
    - grading, 77, 536, 1646, 4489
    - harvesting, 542t, 543m, 1746
    - malformation, 511, 2099, 2786, 2838m
    - marketing, 1646
    - packing, 9, 535, 1231, 2134
    - pigments, 3915
    - quality, factors affecting, 497, 510, 1626, 2802
    - respiration, 533, 2635
    - ripening, 532, 1623, 2832, 2833, 3522, 3915
    - set—
      - under glass, 64
      - heat inhibits, 1628
      - and parthenocarpy, growth substances affect, 511-513, 1630, 2801, 2803, 2804, 3922
    - size, factors affecting, 2787, 2794
    - spray residues, 371, 536, 2825, 3955g
    - storage—*see below*, storage
    - yield—
      - components analysed, 531
      - glasshouse construction affects, 493
      - growth substances affect, 513, 2802, 2804, 3922, 3923
  - glasshouse heating system, 500
  - growing—*see also below*, varieties—
    - in Argentina, 1647o
    - a book on, 4448
    - in Great Britain, 2, 4448
    - labour requirements, 1489
    - in Norway, 1623
    - in the U.S.A., 3908
    - in Yugoslavia, 1492
  - growth—
    - characters, environment affects, 2787
    - gigas forms, 3357
    - radioactive materials affect, 2177

Tomato—growth (*continued*)—
    substance responses—*see also above*, fruit set *and* yield, *and below*, herbicides—543 l, 1106, 1111, 1145j, 2099, 2153, 2802, 2806, 3921-3923, 4480
  herbicide injuries, 2563, 2618-2620, 2621k
  hybrids—
    parthenocarpic, 1619
    vegetative, 1622, 2794
    vigour and yield, 1617, 3763
  illumination—*see above*, climate, light
  leaf(ves)—
    malformation, 3430
    phosphorus recretion by, 2181
    temperatures, 2793
    water absorption by, 20
  nutrition—*see also below*, soil management—
    boron, 2810, 2811
    calcium, 517
    carbon dioxide, 1504, 2799, 3426
    cation uptake, 768
    chlorine, 2146
    cobalt, 2812
    copper, 41, 1634
    foliar, 504, 517, 524, 2182, 2636, 2643, 2788, 2805, 2809, 3925, 3930
    iodine, 2182, 2643
    iron, 41, 2812, 2813, 3927
    through irrigation water, 3317
    manganese, 1116, 1118, 2811, 3927
    manuring, 505, 542g, 1501, 2807, 3304, 4480
    molybdenum, 1116, 3928, 3929
    nickel, 2813
    nitrogen, 510, 511, 519, 521, 2640, 2804, 2808, 2809, 2818, 3402, 3917, 3925
    phosphorus, 1629, 2177, 2181, 2812, 2813, 3911, 3926, 4485
    potassium, 510
    salt tolerance, 3779
    soil fumigation affects, 509
    sucrose, 504, 2805
    sulphur, 2629
    yttrium, 3407
    zinc, 516
  packing—*see above*, fruit
  pest(s)—*see also below*, sprays—
    caterpillar (*Plusia chalcites*), 3933
    *Drosophila* spp., 2831
    flea beetles (*Epitrix* spp.), 1645
    fruit worm (*Heliothis armigera*), 3933
    melon fly (*Dacus cucurbitae*), 454, 3838
    mite, russet (*Phyllocoptes* (*Vasates*) spp.), 529, 3956o
    mite, spider (*Tetranychus* sp.), 530, 1521, 2652
    nematodes, 542y, 2647, 2828-2830, 3945
    in New Zealand, 542p
    small fruit borer (*Neoleucinodes elegantalis*), 3946
    vegetable weevil (*Listroderes obliquus*), 1644
  physiology—*see also above*, climate *and* growth—
    enzyme activity, 41, 508, 3928

Tomato—physiology (*continued*)—
    nicotinic acid synthesis, 2792
    photoperiodic responses, 497, 3910
    photosynthesis, 2799
    respiration, fruit, 533
    transpiration, 415
    water relations, 20, 507, 2148, 2637, 3916, 3917, 4480
  planting—
    spacing, 505, 1647 l, 2669, 2790, 2791
    time of, 506
    transplanting, sprays for, 1633, 2805
  pollination—*see also above*, fruit set—artificial methods, 496, 1057
  pots for—*see below*, seedlings
  products, juice, 2838j
  propagation by cuttings, 3920
  propagation by grafting—*see also below*, rootstocks—495
  pruning, 1623, 2785
  research in—
    Great Britain, 494, 1041
    Jamaica, 836
    New Zealand, 1038
    South Africa, 2622
    Switzerland, 1044
    the U.S.A., 2101
  rogues, 1620, 1621
  roots, culture of excised, 80c, 1105, 1116, 1648c, 2208y, 2806, 3921
  rootstocks, *Nicotiana glauca* as, 409
  rootstocks, *Solanum* spp. as, 495, 3955p
  seed—*see also below*, sowing—
    extraction, 1625, 3940
    germination, 1518, 3371
    hybrid, 496, 1057, 2791
    pleiocotyly, 1621
    sowing—*see also above*, planting—
      depth, 3919
      direct *vs.* transplanting, 3919
      times, 501
    treatment, 1647d, 3371
  seedlings—
    artificial light for, 3430
    pots for, 503, 2808, 4448
    raising, 501, 3772
  soil—
    amendments, 411, 542w, 2188, 3926
    management—*see also above*, nutrition—
      glass covers, 2800
      irrigation, field, 164
      irrigation, glasshouse, 507, 1506, 2638, 2814, 3918
      mulching, 3774, 3775
      ring culture method, 1624
      rotations, 506, 3773
      sterilization or fumigation, 509, 1518, 2788
      weed control—*see also above*, herbicides—2618, 2619, 3708
    temperature, 3911
    water availability, 1647h
    water table, 2205
  spacing—*see above*, planting

- Tomato (*continued*)—
  - spray(s)—
    - injury, 3933
    - insecticides, growth and flavour effects, 425, 1647g, 3933
    - nutrient—*see above*, nutrition, foliar
    - residues, 371, 536, 2825, 3955g
  - storage—
    - diseases, 308
    - gas, 3522
    - moss, 2322f
    - respiration in, 2635
    - temperature, 2833, 4490
    - wraps, 2383
  - tobacco grafted on, 559
  - tree—*see* Tree-tomato
  - tying, 2785
  - varieties—*see also above*, growing *and* hybrids—
    - in Algeria, 1618
    - in Canada, 3956 l, 4463
    - glasshouse, 1647k
    - in Italy, 2789
    - jointless stem, 4484
    - Kvithamar, 2788
    - in Tunisia, 4487
    - in the U.S.A., 3955x
  - water requirements and responses—*see above*, climate, physiology *and* soil
  - *Yearbook, American*, 3908
- Tools—*see also* Apparatus—
  - auger for soil sampling, 1307
  - clipper for tea plucking, 1007
  - for cutting and treating plant tissue in one operation, 1673
  - for grafting, 1982
  - hoes, 2202
  - injectors for soil fumigation—*see* Fumigation, soil
  - knife for harvesting asparagus, 3794
  - ladders, 895
  - for leaf sampling, 3433
  - nutcracker, 4254
  - spades, 73
  - for transplanting, 74, 970
- Top-working—*see* Frame-working
- Toxins, plant reactions to, 372e
- *Toxoptera aurantii*, 1521
- *Toxoptera graminum*, 4410
- Tractors, horticultural, 2208t
- Trade—
  - cacao, 853, 1933, 1934
  - citrus, 754, 4181, 4182, 4265c, 4265f
  - coffee, 3151, 4322
  - crops, in Switzerland, 3443p
  - crops, world, 3326
  - essential oils, 4068b
  - fats and oils, 2100
  - fibres, 2892
  - fruit, 83, 1146, 2111
  - horticultural products in the U.S.A., 2127
  - nuts, 2111
  - plantation crops, 1016y, 1914
  - tea, 3270p
- *Tradescantia paludosa*, 1096, 1813d, 1813v, 4098
- Transpiration—*see also individual plants*—
  - evapo-, 415, 1086, 3363, 3443k
  - frost hardiness in relation to, 1187, 1320
  - measurement of, 79z
  - nitrogen nutrition affects, 2184
  - soil moisture affects, 1834
  - sprays to reduce, 1633
  - in tropical crops, 1970
  - vigour related to, 3373
- Transplanting—*see also particular plants under* planting—
  - growth substances to facilitate, 560, 561
  - plastic covers for, 2925
  - resin sprays to facilitate, 1633
  - stem wraps to facilitate, 953
  - tools for, 74, 970
- Transport of fruit and vegetables, 427
- Transport of fruit in water, 3534
- *Tranzschelia pruni-spinosae*, 299, 2467, 3689f
- Traps for insects, 3875
- Tree(s)—*see also* Fruit *and* Ornamentals, woody—
  - distribution, analysis of, 2133
  - for fodder, 4454
  - grubbing, a machine for, 3436
  - planting, a machine for, 3435
  - -tomato growing in New Zealand, 1047
- Trials—*see under* Statistical
- *Trialeurodes vaporariorum*, 2704
- *Trianthema portulacastrum*, 3743
- *Trichoderma koningi*, 2739
- *Trichoderma viride*, 4434
- *Trichodorus* spp. on celery, 1547
- *Trichogramma* spp. for biological control, 4461, 4476
- *Tricholoma equestre*, 1591
- *Trichoplusia ni*, 2655
- Tricotyly in plants, 653
- *Trifolium alexandrinum*, 3030
- *Trigonella foenum-graecum*, 3030
- Trigonelline determination, 1017a
- Trinidad and Tobago—
  - banana growing and research, 845, 3109
  - cacao growing and research, 1024, 1939, 3118
  - citrus research, 3020
  - Dir. Agric., A.R., 839, 3313
  - Eastern Caribbean Farm Inst., 3327
  - imp. Coll. trop. Agric., A.R., 3323h
  - Piperaceae of, 4068z
  - plant import regulations, 2079j
  - sugar cane growing, 3226
- *Trionymus diminutus*, 4036
- *Trionymus sacchari*, 2060
- Triterpene acids from guava leaves, 4446e
- *Tripterygium wilfordii*, 4053
- Tropical—
  - agriculture, education in, 1913, 3101, 3327, 4266
  - agriculture, mechanization of, 3108
  - crops, ecological requirements, 840
  - fruits, ecological requirements, 840
  - fruits, wines from, 4446z
  - Products Dep., Amsterdam, A.R., 1050

Tropical (*continued*)—
  trees, leaf and branch abscission, 23
Tropics—
  dry, crops for, 3278
  insecticides for use in the, 3293
  roy. Inst. for the, Amsterdam, A.R., 1061o
Tropism, a review, 3364
Tryptophan oxidation, 1648i
*Tubercularia confluens*, 2992
Tulip—*see also* Bulbs—
  breeding, 2956
  bulb dissection, 4119
  bulb storage, 1795, 4117, 4163b
  diseases, fungus, 1777
  diseases, virus, 2970
  forcing, 655, 1057, 2968
  growing in the U.S.S.R., 4118
  growth, X-ray treatment of bulb affects, 2969
  history, 4116
  nutrition, 50
  planting, machines for, 735w
  soil management, irrigation, 654
  temperature responses, 1795
  varieties, 4116
  *Year Book, R.H.S.*, 681
Tung (*Aleurites montana* and *A. fordii*)—
  by-products, 3099
  climate, frost resistance, 831
  clones *vs* clonal seedlings, 1908
  composition, fruit, 3096
  composition, leaf, 3095
  fruit storage, 1055
  growing in Angola, 3299
  growing in the U.S.A., 4265d
  hulling, 3098
  nutrition—
    by injection, 1909
    manuring, 830, 831, 1908, 3095-3097
    minor element, 831, 3097
    a review, 4453
  oil—
    analysis, 1911, 2904
    losses in hulling, 3098
    production and trade, 2100
    a review, 1910
  propagation by grafting, 1982
  research—
    in Indo-China, 1045, 1909
    in Nyasaland, 3094
    statistical design of trials, 3341
    in the U.S.A., 2101
  seed—
    germination, 1908
    planting machines, 4490
    storage and processing, 1910
  soil management, weed control, 1908
  varieties, 10
Tunisia—*see also* Africa, North—flora of, 3347
Tunisia, Service bot. agron., A.R., 4487, 4494m
Turf—*see* Lawn
Turnip—
  composition, plant, 3898
  diseases, fungus, 3897, 4465
  diseases, virus, 2772
Turnip (*continued*)—
  ecology, 3956j
  pests—
    gall weevil (*Ceuthorhynchus pleurostigma*), 3956e
    maggots (*Erioischia* (*Hylemyia*) *brassicae*), 3899
    mustard beetle (*Phaedon cochleariae*), 3901
  seed production, 3769
  spacing, 3955u
Turrialba, cacao research, 1940
*Two and a bud*, a new periodical, 4493
*Tylenchorhynchus claytoni*, 3991
*Tylenchulus semipenetrans*, 3066

Uganda Dep. Agric., Rec. Invest., 4494k
Ultrasonic irradiation, plant responses to, 3371, 3372
Umbelliferous fruits, essential oil content, 4021
*Unaspis citri*, 4264q
*Unaspis euonymi*, 1803
*Uncinula necator*—*see* Vine diseases
United Kingdom—*see* Great Britain *and* Ireland, Northern
United States—*see also individual States for reports*—
  Administ. agric. Res., A.R., 1054
  agricultural books, a list of, 1145a
  agricultural Res. Center, Beltsville, Md, 1066
  agric. Statistics, 82, 577d, 1053, 2127, 3326, 4488
  asparagus growing, 3793
  avocado growing, 832f
  bean growing, 458, 3859, 3955k
  capsicum growing, 538
  carob growing, 832d
  chrysanthemum growing, 1756
  citrus growing, 755
  Dep. Agric.—
    agric. Exp. Stats, A.R., 4489
    Bureau agric. industr. Chem., A.R., 1055
    Bureau Ent. Plant Quarantine, A.R., 1056
    Bureau Plant Ind., Soils, agric. Engng, A.R., 1057, 2122, 4490
  diseases, 1376, 2397
  flower growing and research, 735m, 1747, 1771, 3011h, 3011o, 3011p, 3011q, 3011r
  fruit—*see also below*, small fruit—growing and research, 1236p, 4452
  fruit varieties, 201d, 1159, 1160, 3458
  horticultural organizations, 1145q, 1145r
  lawn grasses, 1780, 1781
  melon growing, 3956n
  mushroom growing, 3955c
  nut growing and varieties, 1236p
  okra growing, 3956p
  olive growing, 811
  ornamental plants, 4138
  pests and their control, 1376
  plants, desert, uses of, 2868
  safflower growing, 4068s
  sapodilla growing, 2075

United States (*continued*)—
  seed quality, 2924, 3841
  small fruit growing and varieties, 3572c
  subtropical fruits, 4264t
  sugar programme, 3200
  tobacco growing, 548, 577d, 1649, 1650, 1697f, 3980
  tung growing, 4265d
  vegetable growing and varieties, 2624, 2838f, 3765, 3955d
  vegetable processing, 3766
  vine growing, 2350, 3572d
  weeds and their control, 3691, 3694, 3725, 3759c, 3759k
  windbreaks, 1324
  *Yearbook of Agriculture 1953: Plant diseases*, 3291
Urea—
  absorption through leaf cuticle, 3502, 3974, 3975
  biuret from, 4167
  foliage sprays, 148, 1836, 2276, 2277, 2809, 3133, 3502, 3925, 3974, 3975, 4264z, 4296-4298
  as a nitrogen fertilizer, 1052
Uredinales, plant diseases caused by, 3604
*Urena lobata*, 4027
*Urginea maritima*, 2901
*Urocystis cepulae*, 479, 1520, 1598, 2113, 2755
*Uromyces appendiculatus*, 3868
*Uromyces caryophyllinus*, 634
*Urophorus humeralis*, 808
*Uropyxis sanguinea*, 1808
*Urtica* spp., control, 376
Uruguay, diseases of fruit crops, 2545v
U.S.S.R.—
  apple growing and varieties, 2221
  apricot growing and varieties, 3450
  cherry rootstocks, 3484
  climate, 4449
  coriander growing, 2887
  economic geography, 4449
  fruit growing, 3449
  pepper growing, 1705
  strawberry varieties, 2340
  subtropics, economic plants, 1814
  tulip growing, 4118
  vegetable growing, 1498
  vine growing, 1270, 2368
  woody ornamentals, 4139

*Valeriana officinalis*, 586
*Valsa eugeniae*, 883-885, 3139
*Valsa leucostomoides*, 2919
Vanadium in plant nutrition, 1120, 1145l, 2138
*Vanda* diseases, 690
Vanilla—
  growing, a review, 1742g
  research in Madagascar, 4273
  seed germination, 4005
  species and varieties, 1742q, 4005
Vanillin determination, 2872
Variety(ies)—
  collections—
    citrus, 3102
    deciduous fruit, 95
    nut, 1891
    olive, 4487
    tropical crops, 3102
  descriptions, biometrical, 4255
  patents for new, 2208u
  trials—*see under separate crops*
*Vasates destructor*, 529
*Vasates lycopersici*, 3956o
Vegetable(s)—*see also particular vegetables*—
  breeding and selection, 2909
  bug, green (*Nezara viridula*), 3697
  composition, 410, 412, 1236g, 1505, 3780, 3781
  diseases and their control, 542c, 1033, 1647r, 1813m, 3291
  economics, 2628
  flavours, causes of, 542v
  frost injury, 2418, 3586
  growing—*see also below*, varieties—
    in Argentina, 1647y
    in the Belgian Congo, 407
    bibliography on, 1145b
    in Bolivia, 3955e
    in Denmark, 4457
    in Germany, 2628
    under glass, 1647n
    in Great Britain, 6, 1029, 1078, 2839b, 3324, 3325
    at high altitudes, 1488
    in Hong Kong, 1491
    in India, 3105
    in Italy, 543c
    in Japan, 3768
    in Jordan, 4478
    manuals on, 1029, 1032, 4457
    in Morocco, 3956g
    in New Zealand, 2120
    in the U.S.A., 1032, 3765
    in the U.S.S.R., 1498
    in Yugoslavia, 3330
  marketing in Holland, 80g
  marrow, planting, 2669
  nutrition—
    boron, 1503, 1508
    calcium, 50
    fertilizer placement, 413
    leaf analysis a guide to, 3778
    manuring, 1047, 1501, 2208a, 2646
    molybdenum, 1508
    phosphorus, 2185
  pests and their control, 426, 1435i, 1647r, 1647z
  planting, spacing, 2631, 3770
  processing in the U.S.A., 3766
  research—
    in Australia, 2109, 4482
    design and analysis of trials, 1487, 3343
    in Great Britain, 2104, 2107, 4481
    in Pakistan, 1486
    Stat., nat., Wellesbourne, A.R., 3956m

- Vegetable(s)—research (*continued*)—
    - in the U.S.A., 2097
  - root—*see* Root crops *and individual species*
  - seed—
    - disinfection, 421
    - germination, 417
    - pelleting, 1494, 3771
    - production in—
      - Canada, 3769
      - Cyprus, 2098
      - Germany, 2838u
      - Venezuela, 1493
    - quality in New York, 2924
    - storage, 650
    - testing, 2634
  - soil—
    - conditioners, 1125
    - fumigation affects, 1648b
    - heating, 1496, 1497
    - management—
      - irrigation, 414, 2639, 3294
      - mulching, 55, 3295, 3416
      - weed control, 404c, 1483, 2599-2601, 3705, 3752, 3753
  - storage—*see also* Storage—
    - cold, 2315
    - general, 78
    - physiology in, 3368
    - respiration in, 2635
  - transport, 427
  - trials, statistical design and analysis, 1487, 3343
  - varieties—*see also above*, growing—
    - in Austria, 1488, 2626
    - in Canada, 1042, 1048, 2623, 3306
    - disease resistant, 2625
    - in Great Britain, 1527, 4481
    - in Holland, 1647c
    - new lists of, 10
    - in Sweden, 3762
    - in the U.S.A., 405, 1490, 2106, 2624, 2838f, 3761, 3955d
  - washing, 419, 420
  - weevil (*Listroderes* spp.), 426
  - as windbreaks, 1500
  - windbreaks for, 2641
- Velamen cells in roots, 658, 689
- Venezuela—
  - cacao growing, 3131
  - sugar cane growing and research, 2042
  - vegetable seed production, 1493
- *Venturia—see also* Apple diseases *and* Pear diseases—*cerasi*, 1349
- Vermiculite, horticultural uses of, 3079, 4069
- Vernalization—
  - anatomy of plant affected by, 3358
  - of beetroot, 3886
  - of *Campanula medium*, 2933
  - chemical, 3845
  - of chrysanthemum, 1813s
  - of endive, 4480
  - of lentil, 462
  - of pea, 3358, 3845
  - of *Perilla*, 2945
- Vernalization (*continued*)—
  - of spinach, 2782
- *Veronica* spp., seed identification, 384
- *Verticillium*—
  - *albo-atrum*, 609, 615j, 1749, 1758, 3944, 4025, 4040, 4041, 4044, 4175
  - *dahliae*, 2112, 2941, 3944
  - spp. on—
    - blackberry, 2324
    - eggplant, 3948
    - peppermint, 4024
    - snapdragon, 1647p, 1647q
    - tomato, 1647p, 1647q
- *Viburnum* spp., propagation by cuttings, 1796
- *Vicia faba—see* Bean (*Vicia*)
- *Vicia hirsuta*, 3719
- Victoria—*see under* Australia
- *Vigna sinensis*, 2689
- Villa Taranto, Lake Maggiore, 3323k
- Vine (*for subjects relating to grapes see below under* fruit *and see also Vitis*)—
  - anatomy, graft union, 3562
  - anatomy, stem, 2362, 2363, 2395w
  - breeding, 4480
  - climate—
    - cyclical variations, 2344
    - heat injury, 1322
    - light responses, 2409
    - micro-, 1145m, 1272
    - rainfall in relation to grey mould, 1356
    - spring frost injury or protection, 2351, 2418, 2425, 2426, 3689i, 3689w
    - sunlight and fruit ripening, 1285
    - winter injury, hardiness or protection, 1316, 1318, 1319, 2369, 2370, 3689i
  - composition—
    - fruit, 1295a, 1295j, 2305, 2371, 2375, 2409, 3558, 3572s
    - leaf, 2374
    - seed, 2375
    - shoot, 1295d, 2362
  - diseases—
    - bacterial, blight (*Erwinia vitivora*), 1335
    - fungus—
      - anthracnose or black spot (*Elsinoë ampelina*=*Sphaceloma ampelinum*=*Gloeosporium ampelophagum*), 305, 372p
      - bitter rot (*Melanconium fuligineum*), 1363
      - downy mildew (*Plasmopara viticola*), 306, 1357-1361, 2471-2475, 2478, 2534, 3622-3624, 3671, 3672
      - grey mould (*Botrytis cinerea*), 1356, 2477, 2478
      - powdery mildew or oidium (*Uncinula necator*), 1362, 2475, 2476, 2478
      - white rot (*Coniothyrium* (*Coniella*) *diplodiella*), 2479, 3671
    - general, 3567
    - non-parasitic—
      - chlorosis, 2409
      - leaf browning, 1322
      - leaf reddening, premature autumn, 3578

Vine—diseases (*continued*)—
  virus—
    infectious degeneration, court-noué or fan leaf, 278, 279, 1256, 2438-2440, 2545k, 3689o
    mosaic, 372o, 3689n
    Pierce's disease, 2437
 economics, 1264
 flower bud initiation and development, 244d, 1275, 1277, 1278, 2376
 flower or fruit drop, 1321, 2380, 2381, 3559, 3564
 fruit—*see also above*, composition—
  bunch size, 1286
  dried, 1235, 1295a, 2382
  drop—*see above*, flower
  packing, 9, 2322j, 3517
  picking of table grapes from wine crops, 2378
  production and trade, 3326
  quality, factors affecting, 233, 234
  ripening, growth substance delays, 2379
  ripening, studies, 1285, 2375, 3301, 3572j
  set, growth substances affect, 1284
  set under glass, 64
  size, growth substances increase, 236
  size, ringing increases, 3567
  storage, 2383, 2384, 3568, 3569, 4480
  thinning, 2373
  yield, leaf area related to, 233
  yield, solar activity affects, 2344
 growing—*see also below*, varieties—
  in Argentina, 244e
  in Belgium, 3557
  in Brazil, 2355
  in France, 2346
  in Germany, 2349, 3557
  in Great Britain, 1023, 2090
  in Greece, 2346
  in Holland, 2346
  in Italy, 219, 1258-1259, 1295g, 2346, 2347, 2357-2360, 2395j, 2395k, 2395p, 2395r
  in Israel, 2346
  in Luxemburg, 2346
  manuals on, 1023, 2090
  in North Africa, 2346, 2348
  in South Africa, 2211
  in Spain, 2346
  on steep slopes, 3572h
  in Switzerland, 2356, 2395q, 3566
  in the U.S.A., 2350, 3572d
  in the U.S.S.R., 2368
  in Yugoslavia, 1260
 growth—
  altitude affects, 1273
  of laterals, 1276-1278
  lignification, 1273
  -substance responses, 236, 1284, 2379
 herbicide injury to, 390, 1480, 3583
 leaf—
  area, yield related to, 233
  autumn colouring and browning, 1322, 3578

Vine—leaf (*continued*)—
  composition, 2374
 mutations, 223, 224
 nutrition—*see also below*, soil management—
  boron, 2404
  calcium, 3301
  compost, 1282
  foliar, 1305, 2410
  iron, 252
  lime-induced chlorosis, 252
  magnesium, 255, 1304, 2546n, 3578
  manuring, 1271, 1281, 2395e, 2395m, 4480
  nitrogen, 2409, 3301, 3564
  phosphorus, 2376, 3301, 3565, 4489
  potassium, 1305, 2410, 3301
  a review, 4453
  zinc, 4490
 pests—
  *Antispila rivillei*, 1390
  *Boarmia rhomboidaria*, 3652
  cutworms, 2511
  grape berry moth (*Polychrosis* spp.), 333, 2478, 2534
  *Harrisina brillians*, 3651, 3689a
  *Hyalarcta hubneri*, 735r
  leafhoppers (*Erythroneura variabilis*), 3659
  mealy bug (*Pseudococcus* and other spp.), 326, 2503
  mites (several species), 314, 2478
  moth (*Clysia ambiguella*), 333, 2478, 2534
  nematodes, 1295f
  orthopterous, 3660
  phylloxera, 337, 1378, 2512
  *Psalidium maxillosum*, 317
 physiology—
  lateral shoots affect, 1276
  photosynthesis, 1279, 1281
  polarity, 2361, 2395u
  water balance, 2395w
 planting, contour, 229, 3572k
 planting, spacing, 1271
 pollen germination, 2395c
 pollen longevity, 132
 pollination, 1274, 3559
 processing, juice, 3539k
 propagation—*see also below*, rootstocks—
  by cuttings—
    methods, 227, 228, 1256
    osmotic pressure affects, 2364
    supply of material for, 1263
  economics, 1264
  by grafting—
    histology of union, 2363, 3562
    on cuttings, 1265
    factors affecting, 2362
    machine, 225, 3562
    growth substances for, 3563
    paraffin waxes for, 226
    a review, 1266
 pruning—*see also below*, training—233, 234, 1277-1279, 2368-2371, 2425, 3566, 3567
 prunings, shredding of, 1283
 research in—
  Australia, 235, 4482

- Vine—research in (*continued*)—
    - Germany, 220
    - Italy, 1257, 3556
    - New Zealand, 1047
    - North Africa, 2096, 4487
    - South Africa, 3314
    - Switzerland, 1044
  - ringing, 3567
  - rootstocks—*see also above*, propagation—
    - in Argentina, 1268, 1269
    - in Germany, 2351
    - in Italy, 1271, 2367
    - -scion relationships, 2366
    - in Sicily, 1267
    - in Tunisia, 3561
    - in the U.S.A., 3560
    - in the U.S.S.R., 1270
  - scion-rooting, 2365
  - shoot compost, 1282, 2096
  - soil—
    - management—*see also above*, nutrition—
      - cover crops, green manure, 2279
      - cultivation, machines for, 230, 3436, 3572 l, 3572p
      - irrigation, 1271, 2196, 2377
      - methods compared, 2395m
      - ridging, 1272
      - terracing, 1280
      - weed control, 2598
    - sampling, 1295i
    - waterlogging, 1323
  - spray(ing)—
    - helicopter for, 2530
    - machines for, 2475
    - residues, 367
  - training—*see also above*, pruning—231, 1256, 2367, 2371, 2372, 2395q
  - trellising, 232
  - variety(ies)—*see also above*, growing *and* rootstocks—
    - Altesse, 2354
    - in Belgium, 3557
    - in Canada, 207
    - classification and identification, 2395v
    - Concord, 3560
    - in Czechoslovakia, 2395a
    - in France, 1261, 2354, 3572g
    - in Germany, 2351
    - in Italy, 222, 2345, 2347, 2353, 2367, 3283
    - Marsanne, 2354
    - muscadine, 1363
    - Naples, 221
    - Olivella Vibonese, 1262
    - in South Africa, 1286
    - Syrah, 2352
    - in the U.S.A., 1159
    - in Yugoslavia, 3558
  - windbreaks for, 1272
- Vineland hort. Exp. Stat., Ont., bienn. Rep., 4484
- Violet flower pigments, 3397
- Violet pests, insect, 1766, 2954
- *Virachola isocrates*, 2545x
- *Virola surinamensis*, 1738
- Virus—*see also hosts*—
  - antigens, 4084
  - concentration, host's nutrition affects, 2853, 3866
  - concentration, short-wave radiation reduces, 424
  - disease(s)—
    - control by—
      - antibiotics, 3985
      - *Capsicum* extract, 3952
      - chemotherapeutants, 564, 568, 2855, 2856
      - composting, 423
      - growth substances, 424
      - heat, 424, 983, 984, 2056, 2057, 2435, 3233, 3234, 3601, 4083
      - milk spray, 3935
      - ultra-violet radiation, 572, 1697j, 2854, 3810
    - of deciduous fruits, 270, 2546 l, 3591, 3599, 4465
    - detection by various methods, 1743, 2546i, 3591, 4163 l
    - manuals on, 2087
    - rooting of cuttings affected by, 3988
    - of Solanaceae, 3950
    - susceptibility, factors affecting, 1680, 3982, 3986
    - of tropical crops, 3270d
  - distribution in leaf tissue, 3810
  - inactivation—*see above*, diseases, control
  - radioactive, preparation of, 3987
  - research, a book on, 3323n
  - research in Germany, 2429
  - root nodule bacteria destroyed by, 3955t
  - transmission—
    - by dodder, 4090
    - by insect vectors—
      - aphids as—*see* Aphids
      - leafhoppers as—*see* Leafhoppers
      - thrips as, 1697 l
    - mechanical, 646
    - by seeds, 372h
    - by weeds, 3689 l
- Vitamin—
  - A—*see also* Carotene—
    - content of—
      - cabbage, 3808
      - pumpkin, 1632
      - tomato, 1632
  - B.—*see also* Riboflavin—
    - biosynthesis, 2792
    - content of—
      - cabbage, 3808
      - fruits and vegetables, 1236g
      - saffron, 581
  - C—*see also individual plants under* composition—
    - biosynthesis, 28, 1102, 3396
    - content—
      - of apple, 1213, 1214, 1220, 2301
      - of cabbage, 3809
      - of *Capsicum*, 539
      - of cherry, 1214

- Vitamin—C—content (*continued*)—
    - of citrus fruits, 3045
    - factors affecting, 1631, 2329, 2658, 2660, 2807, 2811, 3045
    - of fruits, general, 3515
    - of pear, 1214
    - of pumpkin, 1632
  - determination, 1145t
  - enzyme relationships, 17
  - in germinating seeds, 3396
  - role in metabolism, 3443y
 - content of edible fungi, 1591
 - content of turnip, 3898
 - plant growth affected by, 25
 - PP content of vegetables and fruits, 3782
- Viticulture—*see* Vine growing
- *Vitis*—
  - *silvestris*, 1295k
  - spp. in India, 2395t
  - spp., nematode resistance, 1295f

- Wageningen—
  - Inst. Breeding hort. Crops, A.R., 4472
  - Inst. hort. Engng, work at, 1067
  - Inst. hort. Tech., A.R., 1058
- Waite agric. Res. Inst., South Australia, Report, 2119l
- Wales—*see under* Great Britain
- Wallflower—
  - air pollution affects, 1084
  - diseases, 1608
  - sowing *vs* transplanting, 1743
- Walnut—
  - anatomy, wood, 2395s
  - climate, spring frost injury, 2416
  - diseases, bacterial, 2443
  - diseases, fungus, 2482
  - flower abnormalities, 3571
  - fossil, in the U.S.A., 2390
  - growing in Germany, 2392
  - growing in Holland, 4472
  - metaxenia in the black, 2393
  - nutrition, 4490
  - pests, insect, 312, 2493, 2494, 2515, 3637, 3638
  - pests, mite, 312
  - pollination, 2392-2394
  - products, 3661
  - propagation, 1293, 2391, 2392, 4472
  - rootstocks, 3469
  - spray residues, 3685
  - varieties in the U.S.A., 1159
- Washing—
  - coffee beans, 4334
  - fruit, machine for, 536
  - pots, machine for, 1142
  - vegetables, 419, 420
- Water—
  - absorption by leaves, 20
  - conservation in North Africa, 88
  - culture—*see* Soilless culture
  - deposits on plant shoots, measurement of, 2192
- Water (*continued*)—
  - relations of—
    - citrus, 1842
    - desert plants, 3288
    - fruit trees, 3515
    - tobacco—*see* Tobacco physiology
    - tomato—*see* Tomato physiology
    - vegetables, 2637, 4480
  - soil—*see* Soil moisture *and* Soil water
  - transfer from fruit to leaves, 4177
- Watercress diseases, 491
- Watercress nutrition, 1052
- Water-lily as food plant, 693
- Watermelon—
  - composition, 3834
  - diseases, 1647x
  - growing in the U.S.A., 542d
  - hybrid vigour, 1557, 2677
  - labour requirements, 1489
  - packing, 3835
  - pests, 454
  - research in the U.S.A., 2101
  - root system, 1557, 2838y
  - seedlings, raising, 1140, 3772
  - soil management, weed control, 2612, 2613
  - varieties, 3308, 3832
- Wattle pests, 327, 1736
- Wattle Res. Inst., Pietermaritzburg, A.R., 2119m
- Wax(es)—
  - carnauba, 3278
  - coatings—*see* Storage
  - plants containing, 2868
  - from *Serenoa repens*, 4068x
  - sisal, 2894
  - sugar cane, 1016n, 2078y
- Weather—*see* Climate, Frost, Hail *and* Sun
- Weed(s)—*see also particular weeds*, Herbicides *and* Woody plants, control of—
  - of Australia, 1455
  - control—
    - of aquatic, 403, 1464, 1465, 2119j, 2571-2574, 3729, 3759o
    - in asparagus—*see* Asparagus, soil management
    - in Australia, 3693
    - in bean, 375, 1479, 2561, 2607, 3756
    - in beetroot—*see* Beetroot, soil management
    - biological, 382, 1485k, 3281, 3697, 3726, 3736, 4465
    - in blueberry, 2592
    - in bulbs, 2581, 2597
    - in cabbage, 1479, 2600, 3708
    - in cacao, 3747, 3748
    - on canal and ditch banks, 2554, 2555, 2570, 2573, 2574, 2621j, 3706
    - in carrot, 1485j, 2561, 2599, 2600, 3754
    - in castor bean, 1448
    - in celery, 1485j, 2611, 3754
    - in chrysanthemum, 2581
    - in citrus, 2559
    - in coffee, 1478, 3749
    - Conf., Proc. of British, 2547

Weed(s)—control (*continued*)—
  in cucurbits, 2612, 2613
  in Denmark, 3692
  ecological principles of, 1436
  experimental, statistical analysis of, 2553
  in gladiolus, 1059, 2582, 2583
  in glasshouses, 2581
  of grasses—*see also Cyperus and Sorghum halepense*—2568, 2586-2588, 2597, 3718, 3721
  in Great Britain, 3692
  in hevea, 2026, 3751
  in Holland, 3695
  in Ireland, 3692
  in Israel, 404b
  in lawns—*see* Lawns
  in leek, 2599
  in lettuce, 1482, 3705
  mechanical, 1437, 2554, 2555
  in melon, 2610, 2612, 2613, 4485
  in narcissus, 392, 1469
  in nurseries—*see* Nursery, soil management
  in onion—*see* Onion, soil management
  in orchards, 391, 404c, 1479, 2590, 2597
  in ornamental plants, 393
  in parsnip, 2599
  in pea—*see* Pea, soil management
  in pineapple, 2558, 3706, 3750
  in raspberry, 2597, 3708, 3739, 3753
  reviews on, 3333, 3693-3695
  on road verges, 376, 2551
  in *Sansevieria*, 395, 1726
  by seed treatment, 1463
  in small fruits, 2590
  by soil fumigation—*see* Fumigation, soil
  in spinach, 2561, 3755
  in strawberry—*see* Strawberry, soil management
  in sugar cane—*see* Sugar cane, soil management
  in Sweden, 3692
  in tea, 3251
  in tobacco, 375, 401, 1484, 2557, 3708
  in tomato, 2618, 2619, 3708
  in tung, 1908
  in umbelliferous crops, 3754
  in the U.S.A., 1376, 3691, 3694
  in vegetables, 404c, 1483, 2599-2601
  in vine, 2598
  and weather conditions, 2621i
 crop relationships, 24
 Res. Inst., Danish, A.R., 404e
 seeds, identification, 384
 seedlings, a book on, 2089
 of the Sudan, 3759a
 of the U.S.A., 3717, 3759c, 3759k
 virus diseases transmitted by, 3689 l
Wellesbourne, nat. Veg. Res. Stat., A.R., 3956m
*Welwitschia mirabilis*, 4161
West—
 African Cacao Res. Inst., Tafo, A.R., 854-856
West (*continued*)—
 African Inst. Oil Palm Res., Benin, 926, 3174
 of Scotland agric. Coll., A.R., 3317
White grub—*see also* Cockchafer—control, 320, 2545o, 2546f
Willow hedge, growth control, 2985
Wilting toxins, 3409, 3410
Wind damage to tomato, 4475
Windbreaks—
 in Germany, 3690x
 hedges as, 2641, 3143
 in Israel, 1853
 a manual on, 2088
 for pear, 2110
 for tobacco, 562
 in the U.S.A., 1324
 vegetables as, 1500
 for vegetables, 2641
 for vine, 1272
Window boxes for house plants, 2930
Wine from tropical fruits, 4446z
Wireworm control—*see also particular crops*—542k, 1604, 1688, 2649, 3871, 3955y
Wisconsin agric. Exp. Stat., A.R., 1059, 1061r, 2113
Wisley Gdns, fruit varieties at, 95
Witch hazel, a medicinal plant, 1716, 4068i
Wood preservatives, 1058, 3440-3442
Woodlands on farms, 2091
Woody plants—*see also individual species and* Ornamentals, woody—
 control of undesirable, 391, 1466, 1467, 1485e, 2026, 2575-2580, 3699, 3716, 3718, 3727, 3730-3738, 3746, 4340
 dormancy breaking, 707
 frost hardiness in relation to wood maturity, 4139
 nutrition, iron, 2186
 in the U.S.S.R., 4139
Wound dressings, 171, 1420, 2448, 3135

*Xanthium*—
 *italicum*, 612
 *pennsylvanicum*, 2160, 2208m
 *pungens*, 3697
 *spinosum*, 409
 spp. in New South Wales, 3759h
*Xanthomonas*—
 *albilineans*, 986, 4398, 4401
 *bilvae*, 1013
 *campestris*, 1536, 3783, 3813
 *juglandis*, 2443
 *pelargonii*, 1760, 1761
 *phaseoli*, 2697, 3783
 *pruni*, 281, 282, 357, 372a, 372v, 2442
 *vesicatoria*, 2815, 3783, 3932
Xanthophylls, leaf, 2139
*Ximenia* spp. as oil plants, 4068n
*Xiphinema diversicaudatum*, 4135
X-rays—
 in breeding, 1154, 3451, 3453, 3842, 4098
 bulbs' response to, 2969
 *Petunia* response to, 2947
 roots induced by, 1094

X-rays (*continued*)—
  use in wood maturity and disease studies, 2363
*Xyleborus dispar*, 322, 3653
*Xyleborus saxeseni*, 3653
*Xylomyges curialis*, 4229

Yearbooks—
  of Agriculture, U.S.D.A., 1953: Plant diseases, 3291
  Amateur Gardening Annual, 1040, 1061h
  Boskoop Soc. Trial Garden, 617
  British W. Indies Sugar Ass., 3198
  Commercial Grower, 3275
  Daffodil and Tulip, roy. hort. Soc., 681
  Danish hort. Soc., 3276
  Empire and Commonwealth, 1051
  Food agric. Statist., F.A.O., 3323g, 4470
  Fruit, 1049
  Fruit Annual, 2111
  Lily, roy. hort. Soc., 676
  Plant Path. Serv., Wageningen, 2119k
  Rhodesian Farmer, 4486
  Rhododendron and camellia, roy. hort. Soc., 726
  Rhododendron-Gesellschaft, 727, 4157
  Tomato, American, 3908
Yeast, disease caused by, 4442
Yew—*see Taxus*
Youngberry growing in Australia, 4482
Yttrium in plant nutrition, 3407
*Yucca* spp. of the U.S.A., 2868
Yugoslavia—
  Academies of Science and Arts, 2208d
  herb growing, 1706
  horticulture in, 3330
  vegetable growing, 1492
Yugoslavia (*continued*)—
  vine growing, 1260, 3558

*Zannichellia palustris*, 1465
Zanzibar—
  crops, 886, 4270
  Dep. Agric., A.R., 883
Zinc—*see also* Fungicides—
  deficiency in fruit crops, 4453
  determination, 3443s
  foliar application, 3502
  frost resistance affected by, 831
  nutrition of—
    apple, 257, 2400
    avocado, 740
    beans, 466, 2693, 2694
    cacao, 1958
    citrus—*see* Citrus nutrition
    coffee, 3270c
    pea, 466
    pear, 2400
    pecan, 1291, 2481
    plum, 1303
    tobacco, 3998
    tomato, 516
    tung, 831, 3097
    vine, 4490
  toxicity, 774, 4198
*Zingiber officinale*—*see* Ginger
Zinnia, tricotyledonous, 653
Zinnia varieties, 4078, 4079
*Zizyphus jujuba*, diseases and pests, 3840
*Zizyphus jujuba*, nutrition, 2412
*Zonocerus variegatus*, 1919
*Zoysia* spp. as lawn grasses, 1780
Zwetsche—*see under* Damson
*Zygophiala jamaicensis*, 1754

**List of Publications, other than books, examined in the compilation of Horticultural Abstracts, Vol. XXIV, 1954, additional to those listed in the Indexes to Vols. XXI, XXII and XXIII.**

Economic reasons prevent the issue of a complete list each year. It is suggested that readers of *Horticultural Abstracts* uncertain of the meaning of an abbreviation or of the place of origin of a publication will probably save time by writing direct to the Bureau.

| *Publication* | *Suggested abbreviation* |
|---|---|
| Agricultural Extension Circular Hawaii Agricultural Extension Service, Honolulu | Agric. Ext. Circ. Hawaii agric. Ext. Serv. |
| Agricultural Information Bulletin U.S. Department of Agriculture, Washington, D.C. | Agric. Inf. Bull. U.S. Dep. Agric. |
| Agricultural Monograph U.S. Department of Agriculture, Washington, D.C. | Agric. Monogr. U.S. Dep. Agric. |
| Annals of the Missouri Botanical Garden, St. Louis | Ann. Mo. bot. Gdn |
| Annual Booklet of the Association of Growers of the New Varieties of Hops, [Secretary and Treasurer at Harrietsham, Kent] | |
| Annual Report of the Agricultural Research Service, Ministry of Agriculture, Hashemite Kingdom of Jordan, Jerusalem | A.R. agric. Res. Serv., Hashem. Kingd. Jordan |
| Annual Report Aomori Apple Experiment Station, Aomori, Japan | A.R. Aomori Apple Exp. Stat. |
| Annual Report of the Cameroons Development Corporation, Bota, Victoria | A.R. Cameroons Devel. Corp. |
| Annual Report of the Entomological Society of Ontario, Guelph | A.R. ent. Soc. Ontario |
| Annual Report of the Government Chemist, Tanganyika, Dar es Salaam | A.R. Govt Chem. Tanganyika |
| Annual Report Mauritius Sugar Industry Research Institute, Port Louis | A.R. Mauritius Sugar Ind. Res. Inst. |
| Annual Report New York State Agricultural Experiment Station, Geneva | A.R. N.Y. St. agric. Exp. Stat. |
| Annual Report of the Rubber Research Institute of Malaya, Kuala Lumpur | A.R. Rubb. Res. Inst. Malaya |
| Annual Report South African Sugar Association Experiment Station, Mount Edgecombe, Natal | A.R. S. Afr. Sugar Ass. Exp. Stat. |
| Annual Report of the West African Institute for Oil Palm Research, Near Benin City, Nigeria | A.R. W. Afr. Inst. Oil Palm Res. |
| Annual Report West Virginia Agricultural Experiment Station, Morgantown | A.R. W. Va agric. Exp. Stat. |
| Araneta Journal of Agriculture, Rizal, Philippines | Araneta J. Agric. |
| Arboriculture Fruitière, Paris* | Arboric. fruit. |
| Archives des Recherches Agronomiques et Pastorales au Viêt-Nam, Saigon† | Arch. Rech. agron. pastor. Viêt-Nam |
| Archives of Rubber Cultivation, Bogor‡ | Arch. Rubb. Cult. Bogor |
| Berichten van de Afdeling Tropische Producten van het Koninklijk Instituut voor de Tropen, Amsterdam | Ber. Afd. trop. Prod. kon. Inst. Amsterdam |
| Bericht Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau, Geisenheim am Rhein | Ber. Lehr- u. ForschAnst. Geisenheim/Rhein |
| Biennial Report Horticultural Experiment Station and Products Laboratory, Vineland, Ont.§ | Bienn. Rep. Vineland hort. Exp. Stat. Prod. Lab. |
| Boletim Técnico do Instituto Agronômico do Norte, Belém, Brazil | Bol. tec. Inst. agron. Norte, Belém |

---

* Formerly Pomologie française.

† Formerly Archives de l'Institut des Recherches Agronomiques de l'Indochine.

‡ Formerly Archief v. d. Rubbercultuur in Nederlandsch-Indië.

§ Formerly Horticultural Experiment Station, Vineland

# LIST OF ADDITIONAL PUBLICATIONS

| *Publication* | *Suggested abbreviation* |
|---|---|
| Boletín Estacion Experimental Agricola de La Molina, Lima, Peru | Bol. Estac. exp. agric. La Molina |
| Boletín de Extensión Universidad Nacional de Cuyo, Mendoza, Argentina | Bol. Ext. Univ. Nac. Cuyo |
| Bulletin Aomori Apple Experiment Station, Aomori, Japan | Bull. Aomori Apple Exp. Stat. |
| Bulletin Arizona Agricultural Experiment Station, Tucson | Bull. Ariz. agric. Exp. Stat. |
| Bulletin California Department of Agriculture, Sacramento | Bull. Calif. Dep. Agric. |
| Bulletin Delaware Agricultural Experiment Station, Newark, Delaware | Bull. Del. agric. Exp. Stat. |
| Bulletin de l'Institut des Fruits et Agrumes Coloniaux, Paris | Bull. Inst. Fruits Agrumes colon. |
| Bulletin de Madagascar, Tananarive | Bull. Madagascar |
| Bulletin Ministry of Agriculture, Sudan, Khartoum | Bull. Minist. Agric. Sudan |
| Bulletin of the National Institute of Agricultural Sciences, Series E, Hiratsuka, Kanagawa | Bull. nat. Inst. agric. Sci. Hiratsuka (Ser. E) |
| Bulletin South Carolina Agricultural Experiment Station, Clemson | Bull. S.C. agric. Exp. Stat. |
| Bulletin United Planters' Association of Southern India, Scientific Department, Tea Section, Coonoor | Bull. U.P.A.S.I. sci. Dep. Tea Sect. |
| Cacao en Colombia, Palmira | Cacao en Colomb. |
| Circular Agricultural Settlement Series Ministry of Agriculture, British Columbia, Victoria | Circ. agric. Settlem. Ser. Minist. Agric. B.C. |
| Circular Delaware Agricultural Experiment Station, Newark, Delaware | Circ. Del. agric. Exp. Stat. |
| Circular Estacion Experimental Agricola de La Molina, Lima, Peru | Circ. Estac. exp. agric. La Molina |
| Circular South Carolina Agricultural Experiment Station, Clemson | Circ. S.C. agric. Exp. Stat. |
| Circular Wisconsin Agricultural Extension Service, Madison | Circ. Wis. agric. Ext. Serv. |
| Compte Rendu, Recherche Agronomique de Madagascar, Alaotra | C.R. Rech. agron. Madagascar |
| Cornell Extension Bulletin, Ithaca, N.Y. | Cornell Ext. Bull. |
| Department of Scientific and Industrial Research Information Series, Nelson, N.Z. | D.S.I.R. N.Z. Inf. Ser. |
| Ecology, Brooklyn, N.Y. | Ecology |
| Food and Flowers, Hong Kong | Food and Flowers |
| Food Investigation Memoir D.S.I.R., London | Food Invest. Mem. D.S.I.R. Lond. |
| Foreign Agriculture Report U.S. Department of Agriculture, Washington, D.C. | Foreign Agric. Rep. U.S. Dep. Agric. |
| Fruit World Annual, Melbourne | Fruit World Annual |
| Gartenbauwissenschaft, Munich | Gartenbauwiss. |
| Gartneryrket, Oslo | Gartneryrket |
| Hawaii Farm Science, Honolulu | Hawaii Fm Sci. |
| Horticultural Circular British Columbia Department of Agriculture, Victoria | Hort. Circ. B.C. Dep. Agric. |
| INF. Storrs Agricultural Experiment Station, Storrs, Connecticut | INF. Storrs agric. Exp. Stat. |
| Information Chilean Nitrate Agricultural Service, London | Inf. Chil. Nitr. agric. Serv. |
| Informe Centro Nacional de Investigacion y Experimentacion Agricola de La Molina, Lima, Peru | Inf. Cent. nac. Invest. Exp. agric. Lima |
| Interim Report Tobacco Research Board of Southern Rhodesia, Salisbury | Interim Rep. Tob. Res. Bd S. Rhod. |

# LIST OF ADDITIONAL PUBLICATIONS

| *Publication* | *Suggested abbreviation* |
|---|---|
| Jaarboek Plantenziektenkundige Dienst te Wageningen, Wageningen | Jaarb. PlZiekt. Dienst Wageningen |
| Journal of Applied Bacteriology, Reading | J. appl. Bact. |
| Journal of South African Botany, Newlands, C.P. | J. S. Afr. Bot. |
| Library List U.S. Department of Agriculture, Washington, D.C. | Library List U.S. Dep. Agric. |
| Lista Bibliografica Instituto Interamericano de Ciencias Agrícolas, Turrialba | List. bibl. Inst. interamer. Cién. agric. |
| Manual California Agricultural Experiment Station, Berkeley, California | Manual Calif. agric. Exp. Stat. |
| Meddelande Alnarpsinstitutets trädgårdsavdelning, trädgårdsekonomiska Byrån, Alnarp, Sweden | Medd. Alnarpsinst. trädgårdsekon. Byrån |
| Memoirs of the College of Agriculture, National Taiwan University, Taipei, Formosa | Mem. Coll. agric. nat. Taiwan Univ. |
| Memoria Accademia delle Scienze dell'Istituto di Bologna, Bologna | Mem. Accad. Sci. Ist. Bologna |
| Memoria Conferencia Anual Asociacion de Tecnicos Azucareros de Cuba, Havana | Mem. Conf. anu. Asoc. Tec. Azucar. Cuba |
| Mimeograph Circular Wyoming Agricultural Experiment Station, Laramie | Mimeo. Circ. Wyo. agric. Exp. Stat. |
| Mississippi Farm Research, State College, Miss. | Miss. Fm Res. |
| Mitteilungen für die Schweizerische Landwirtschaft, Frauenfeld | Mitt. schweiz. Landw. |
| Naturens Verden, Copenhagen | Nat. Verd. Kbh. |
| Obstrundschau, Oeschberg-Koppigen, Switzerland | Obstrundschau |
| Official Report of the Annual Meeting and Conference Dominion Council of Commercial Gardeners Ltd., Wellington, N.Z. | Off. Rep. annu. Mtg Domin. Coun. Comm. Gdnrs, Wellington |
| Pamphlet Tanganyika Department of Agriculture, Dar es Salaam | Pamphl. Tanganyika Dep. Agric. |
| Preslia, Prague | Preslia |
| Proceedings American Society of Sugar Cane Technologists, New Orleans | Proc. Amer. Soc. Sugar Cane Tech. |
| Proceedings of the Annual California Weed Conference, San Luis Obispo | Proc. annu. Calif. Weed Conf. |
| Proceedings of the International Society of Sugarcane Technologists Congress, Jamaica, B.W.I. | Proc. int. Soc. Sugarcane Tech. Congr. Jamaica |
| Progress Report Storrs Agricultural Experiment Station, Storrs, Connecticut | Progr. Rep. Storrs agric. Exp. Stat. |
| Pubblicazione dell'Istituto di Patologia Vegetale, Università di Milano, Milan | Pubbl. Ist. Pat. veg. Univ. Milano |
| Publicacion Miscelanea Estacion Experimental Agricola de Tucumán, Argentina | Publ. misc. Estac. exp. agric. Tucuman |
| [Publication] B.W.I. Central Sugar Cane Breeding Station, Barbados | [Publ.] B.W.I. centr. Sugar Cane Breed. Stat., Barbados |
| [Publication] Department of Agriculture, Victoria, Melbourne | [Publ.] Dep. Agric., Vict. |
| [Publication] European Plant Protection Organisation, Paris | [Publ.] Eur. Plant Prot. Org. [E.P.P.O.] |
| [Publication] Forestry Commission, London | [Publ.] For. Commiss. Lond. |
| [Publication] Indian Tea Association, Tocklai | [Publ.] Indian Tea Ass. |
| [Publication] Institut des Fruits et Agrumes Coloniaux, Paris | [Publ.] Inst. Fruits Agrumes colon. |
| Publication of the Horticulturists' Association of Finland, Helsinki [Finnish] | Publ. hort. Ass. Finland |
| [Publication] New South Wales Department of Agriculture, Division of Plant Industry, Sydney | [Publ.] N.S.W. Dep. Agric., Div. Plant Ind. |

## LIST OF ADDITIONAL PUBLICATIONS

| *Publication* | *Suggested abbreviation* |
|---|---|
| [Publication] Office de l'Experimentation et de la Vulgarisation Agricoles de Tunisie, Tunis | [Publ.] Off. Exp. Vulg. agric. Tunis. |
| Rapport Annuel de l'Institut des Recherches sur le Caoutchouc en Indochine, Laikhê | Rapp. annu. Inst. Rech. Caoutchouc Indochine |
| Rapport du Service Botanique et Agronomique de Tunisie, Tunis | Rapp. Serv. bot. agron. Tunis. |
| Record of Investigations, Uganda Department of Agriculture, Entebbe | Rec. Invest. Uganda Dep. Agric. |
| Report on Cacao Research, Imperial College of Tropical Agriculture, Trinidad | Rep. Cacao Res. I.C.T.A. |
| Report of the Chief of the Bureau of Plant Industry, Soils and Agricultural Engineering, Washington, D.C. | Rep. Chief Bur. Plant Ind. Wash. |
| Research Bulletin Ohio Agricultural Experiment Station, Wooster | Res. Bull. Ohio agric. Exp. Stat. |
| Research Report Ministry of Education, Japan, Tokyo | Res. Rep. Japan Minist. Educ. |
| Review of Research Work at the Faculty of Agriculture, University of Belgrade, Belgrade* | Rev. Res. Work Fac. Agric. Belgrade |
| Revista de la Facultad de Agronomia, Universidad Nacional de la Ciudad Eva Perón, Argentina† | Rev. Fac. Agron. Eva Perón |
| Rhodesian Tobacco, Salisbury | Rhod. Tobacco |
| Rural Advisory Leaflet Edinburgh and East of Scotland College of Agriculture, Edinburgh | Rural adv. Leafl. Edinb. Coll. Agric. |
| Science for the Farmer. State College, Pennsylvania | Science for the Farmer |
| Scientific Reports of the Faculty of Agriculture, Okayama University, Okayama, Japan | Sci. Rep. Fac. Agric. Okayama Univ. |
| Special Circular North Carolina Agricultural Experiment Station, Raleigh | Spec. Circ. N.C. agric. Exp. Stat. |
| Special Circular Pennsylvania Agricultural Extension Service, State College, Pa | Spec. Circ. Pa agric. Ext. Serv. |
| Special Report Iowa Agricultural Experiment Station, Ames | Spec. Rep. Ia agric. Exp. Stat. |
| Station Bulletin Purdue University Agricultural Experiment Station, Lafayette, Indiana | Stat. Bull. Purdue Univ. agric. Exp. Stat. |
| Tabak, Moscow | Tabak [Russian] |
| Tätigkeitsbericht Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse, Geisenheim/Rheingau | Tätigkeitsber. Bundesanst. Qualitätsforsch. Geisenheim |
| Tea Research Journal, Tokyo | Tea Res. J. Tokyo |
| Technical Bulletin Georgia Experiment Station, Experiment, Ga | Tech. Bull. Ga Exp. Stat. |
| Technical Bulletin Kansas Agricultural Experiment Station, Manhattan | Tech. Bull. Kans. agric. Exp. Stat. |
| Technical Paper Division of Plant Industry, C.S.I.R.O., Australia, Melbourne | Tech. Pap. Div. Plant Ind., C.S.I.R.O., Aust. |
| Technical Report British Electrical and Allied Industries Research Association, Leatherhead | Tech. Rep. Brit. electric. Res. Ass. |
| Vegetable Crops Series University of California, Davis | Veg. Crops Ser. Univ. Calif. |
| Verslagen van Landbouwkundige Onderzoekingen, 'S-Gravenhage | Versl. landbouwk. Onderz. 'S-Gravenhage |
| Weeds, New York | Weeds, N. York |

* Formerly Yearbook of the Faculty of Agriculture, Belgrade.

† Formerly Revista de la Facultad de Agoromia, Universidad La Plata.

PRINTED BY HEADLEY BROTHERS LTD 109 KINGSWAY LONDON WC2 AND ASHFORD KENT